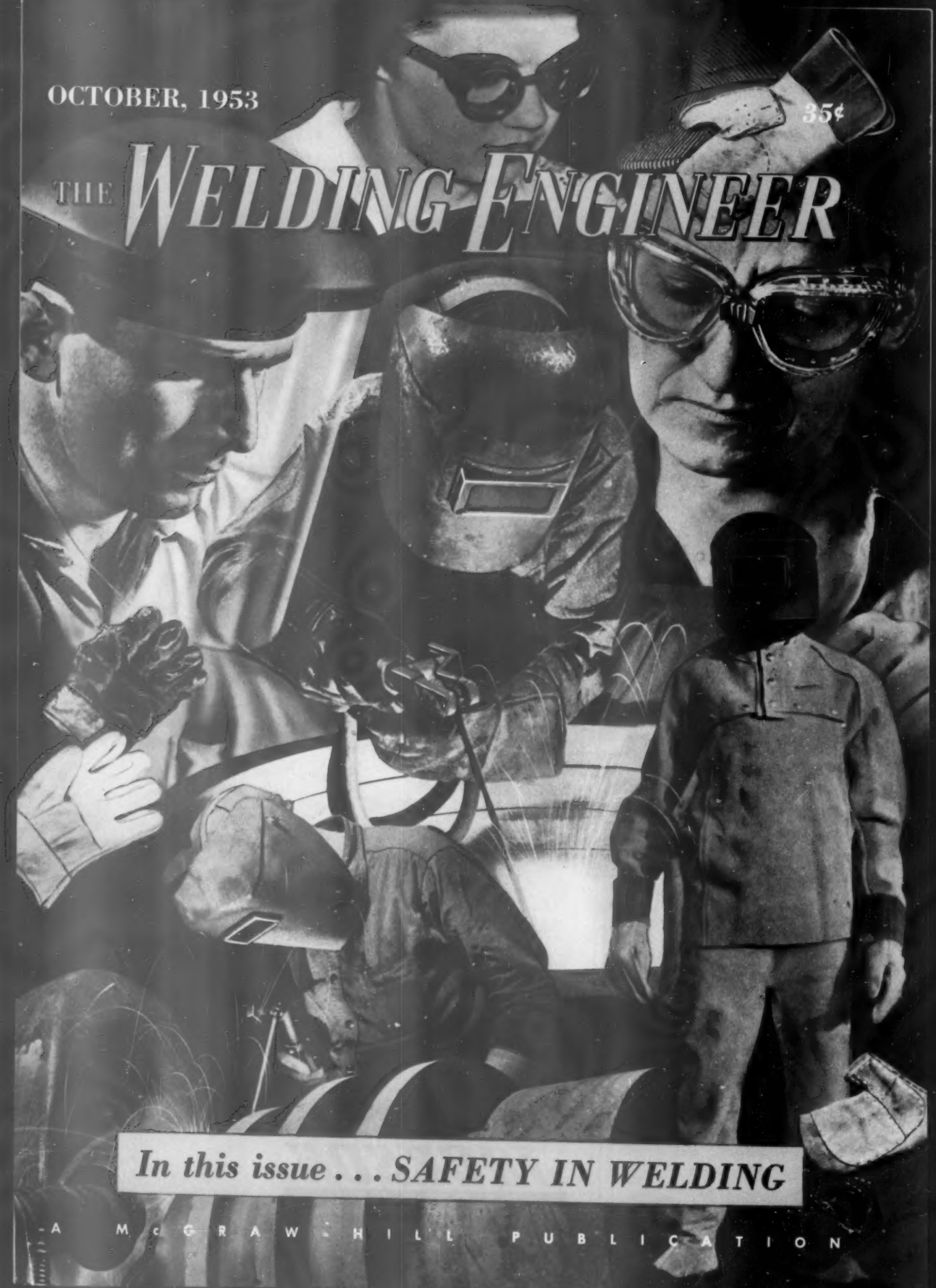
OCTOBER, 1953

35¢

THE WELDING ENGINEER



In this issue . . . SAFETY IN WELDING

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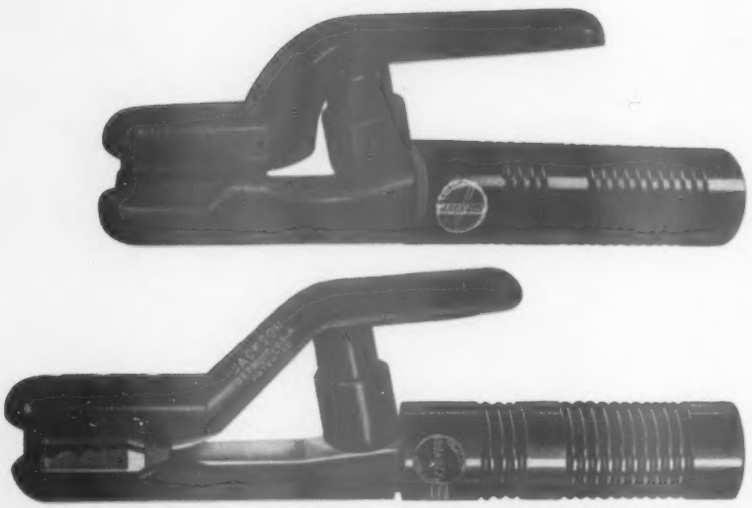

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A-W
for electrodes
1/16 thru 1/4"
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A-5S
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VOLUME 38 NUMBER 10

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OCTOBER, 1953

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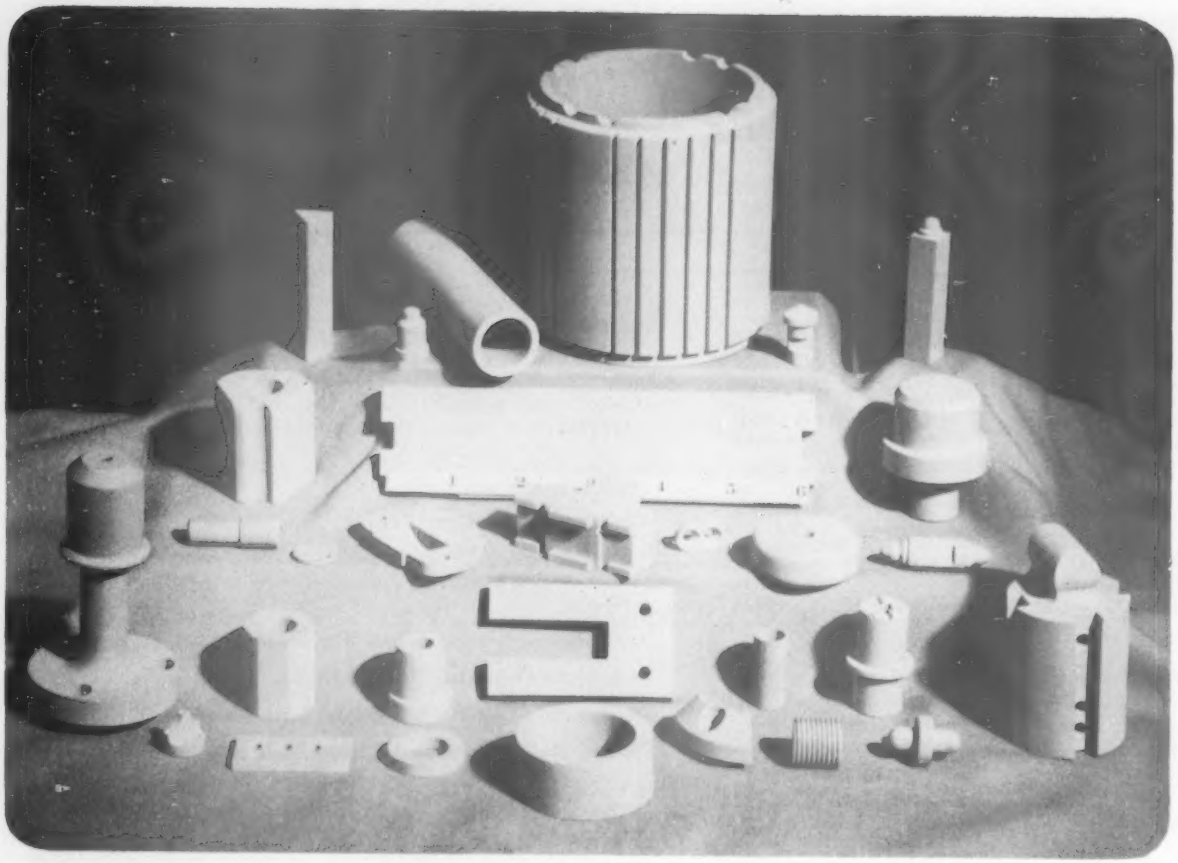

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Courtesy Alloy Rods Co.

PLANT TOUR is included in curriculum of Alloy Rods' distributor sales schools. Here, Alloy Rods executives and trainees watch electrode ends being brushed clean

Courtesy Linde Air Products Co.

WELDING DISPLAY brought visitors to booth of Davis Industrial Products at Douglas County Fair, Roseburg, Ore. From 100 to 150 people stopped in each of 4 days

NEWS

A. O. Smith Moves Welder Plant to Elkhorn

MANUFACTURE of its newly-designed line of a-c and d-c welders has been transferred by A. O. Smith Corp.'s welding products division from Milwaukee to Elkhorn, Wis. New construction is underway to add another 16,000 sq ft to the Elkhorn plant.

The welding products division also has manufacturing facilities at Lancaster, Pa. and the Milwaukee home plant as well as factory service branches at Union, N. J., Dallas, Tex., Chicago and Oakland, Calif.

* * *

Alloy Rods Registers Top Sales School Response

ENTHUSIASTIC congratulations were the rule on the first of Alloy Rods' distributor sales training schools at York, Pa., this summer. Solid bookings were made for the September and November sessions as a result.

In the picture above, a group of trainees, including Frank Blodgett, assistant sales manager, can be seen inspecting electrodes as they pass through a stripping machine. This machine removes the coating on the electrode end for good contact.

All students at these schools are given basic metallurgical training on such phases of the alloy welding field as stainless steel, tool steel, cast iron, bronze welding and low-hydrogen electrode applications.

Classes run a full week, Monday morning through Friday noon and are completely programmed with sales and technical lectures, interspersed with laboratory demonstrations and plant visits. Executives of the company act as instructors and guides for the trainees, who come from all over the country, according to E. R. Walsh, III, general sales manager.

AWS: Buffalo, May 4-7

THE 1954 national spring technical meeting of the American Welding Society will be held at the Statler Hotel in Buffalo, N. Y., May 4-7. The welding and allied industry exposition will be held in the Buffalo Memorial Auditorium, Wednesday through Saturday, May 5-8.

Buffalo is a gateway to the Canadian industrial market. In addition, 75% of the industrial population of both the U.S. and Canada is located within a night's train ride or a several hour plane flight, so attendance at the meeting is expected to be considerable.

Hotel reservation forms will be mailed to AWS members on Dec. 1. For additional information, you may write the AWS at 33 West 39th St., New York City 18.

New Type 347 Alloys To Get Service Tests

TWO special alloy compositions of Type 347 stainless steels have been developed under Atomic Energy Commission sponsorship and will be shortly put to use in power piping. The Public Service Electric and Gas Co., Newark, N. J., will use samples of both new alloys in service tests involving steam at 1,150 F and 2,700 psi. Regular 347 steels will not stand up in this service, says the company.

Reason for the tests is the large use of 347 stainless in the atomic energy program. Commercially available alloys have fallen into two separate categories for service. One is suitable for service with severe corrosion but not high pressure. The other is suitable at high pressures but not for high heats and pressures or highly corrosive conditions at elevated temperatures.

Recently AEC research efforts have been bent to developing an alloy that will have the best properties of both stainless groups. Although the investigation has not yet been completed, the two alloys to be tested look promising. All data from the tests will go to the AEC.

* * *

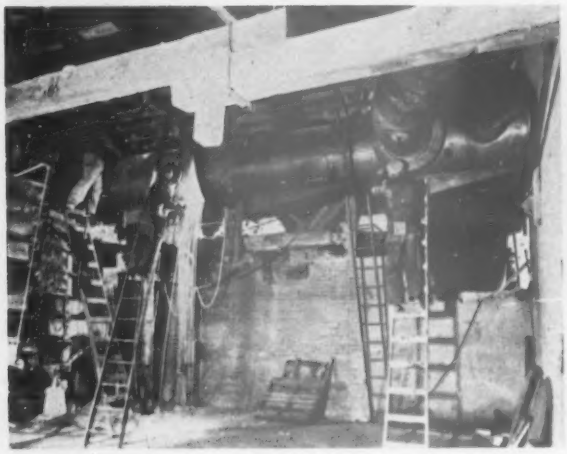
Hardfacing Expert Buys Welding Supply Business

JACK Barry, formerly with the technical sales department of Air Reduction Sales Co., New York City, has purchased the Welders Supply Co., Valhalla, N. Y. The firm serves all of Westchester County for Airco.

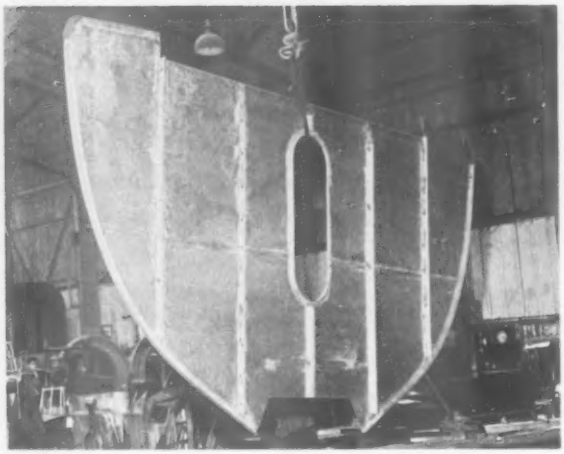
Mr. Barry spent some 12 years in the field as an Airco welding specialist and is considered an authority on hardfacing.

NEWS

from page 5



CORROSIVE action in calcining process at smelter made wrought iron ductwork necessary. Here it's welded



BULKHEAD section in all-aluminum British yacht is welded. The customer is the British Aluminum Company

Welded Wrought Iron Carries Acid Fumes

To protect against damage from corrosion and thus secure maximum performance over a long period of time, ductwork for two Herreschoff-type furnaces was specified to be wrought iron. Installed at a mid-western plant of one of the nation's large smelting companies, the furnaces figure in an important calcining operation.

Aggressive chemicals in the fumes and gases carried by the furnace ductwork are resisted by the wrought iron sheets from which it is fabricated. In addition to the sheet and plate, ranging from 3/16 to ½ in. in thickness, a quantity of 2 to 3½-in. wrought iron pipe was used.

Plate for the ductwork is a product of A. M. Byers Co., Pittsburgh, and was supplied by Indianapolis Machinery & Supply Co. It was shipped to Denver Steel & Iron Co., which welded and installed the duct system.

* * *

C. B. Herrick Mfg. Corp. Makes Welding Machines

THE C. B. Herrick Mfg. Corp. of Cleveland is building a line of standard equipment for automatic welding to be marketed by dealers throughout the country. They will also feature machinery specially designed and built for automatic welding applications.

Clayton B. Herrick is president of the corporation. He has been associated with the Lincoln Electric Co., *Industry and Welding* and for the past several years with the C. B. Herrick Co., Cleveland.

Willard C. Gunzelman is vice-president, engineering and production. He has wide experience in engineering and design and has recently been associated with one of the largest producers of automatic welding equipment.

Jack J. Jarms is vice-president, sales, and has been actively engaged in welding engineering for many years with the aircraft and shipbuilding industries. Recently he has been sales manager of the C. B. Herrick Co.

* * *

Welded Paper Sheets Make Better Wipers

INDUSTRIAL wiping will get a shot in the arm with the advent of a new special paper product. The new wipers are highly absorbent, strong and easily disposable.

Made by Scott Paper Co., Chester, Pa., the new wipers each have two "Perf-Embossed" sheets, specially welded together for extra durability.

* * *

Welded Aluminum Yacht Building in Britain

A 72-FT auxiliary motor yacht is being built at the Beaumaris yard of Saunders-Roe at Anglesey, England. Almost entirely welded by the automatic metal inert gas process, it is the largest aluminum hull ever built in England.

Designed by Laurent Giles & Partners, Ltd., it is being built for the British Aluminum Co. The advantages of using aluminum alloys in yacht building are considerable, including a watertight hull at all times and low maintenance.

Called the "Morag Mhor", the yacht will show several advantages over steel hulled boats. Aluminum allows a better deadweight displacement ratio to be used, or allowing smaller draft, less displacement and power on the same length of hull. Resistance to denting is greater in an aluminum alloy hull, it is said.

Of particular interest in the design and construction of the "Morag Mhor" is the fact that it utilizes both the American and British automatic shielded gas arc welding processes. The hull is framed on the longitudinal system, the transverse strength being provided by nine transverse bulkheads and a system of frames in general about 3 ft apart. The shell plating is welded directly to the longitudinal and bulkhead boundary bars through which the longitudinals are continuous.

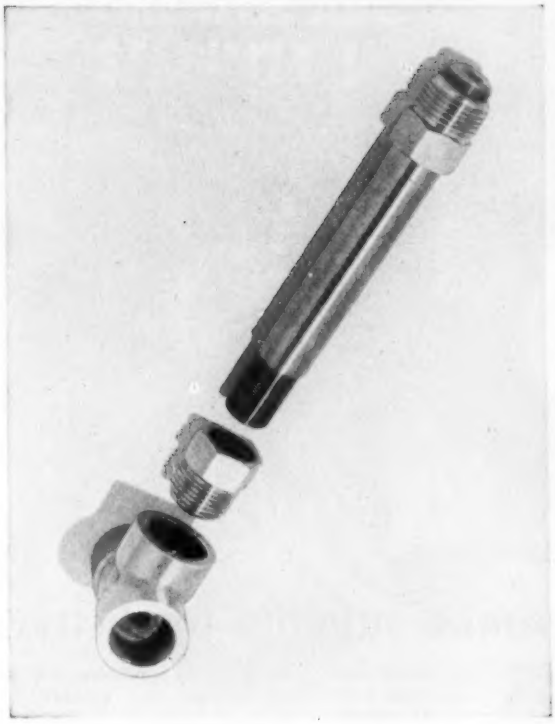
Most of the plating used in the ship ranged between ¼ and ⅜ in. in thickness, but some was as thin as ⅛ in. Hull longitudinals were 1⅜ in. by 1⅝ by 3/16 I beams. Both the main and mizzen masts were made from aluminum plate also, ¼ and 1/5 in. thick respectively. Height of the main mast is 70 ft. Displacement is 45 tons.

Deck equipment includes two aluminum boats, one a 12-ft motor launch and the other a 10-ft sailing dinghy.

—McGraw-Hill World News

(More News on page 107)

A NEW INVENTION



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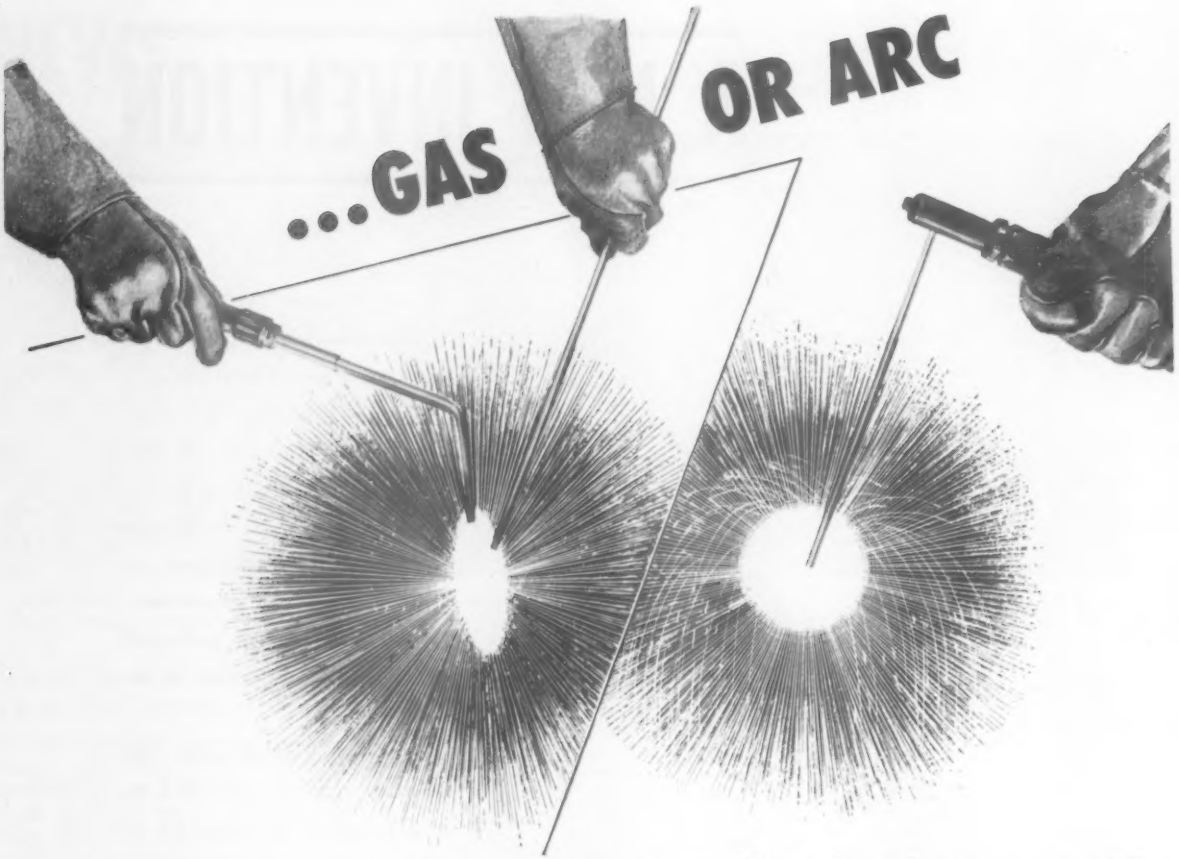

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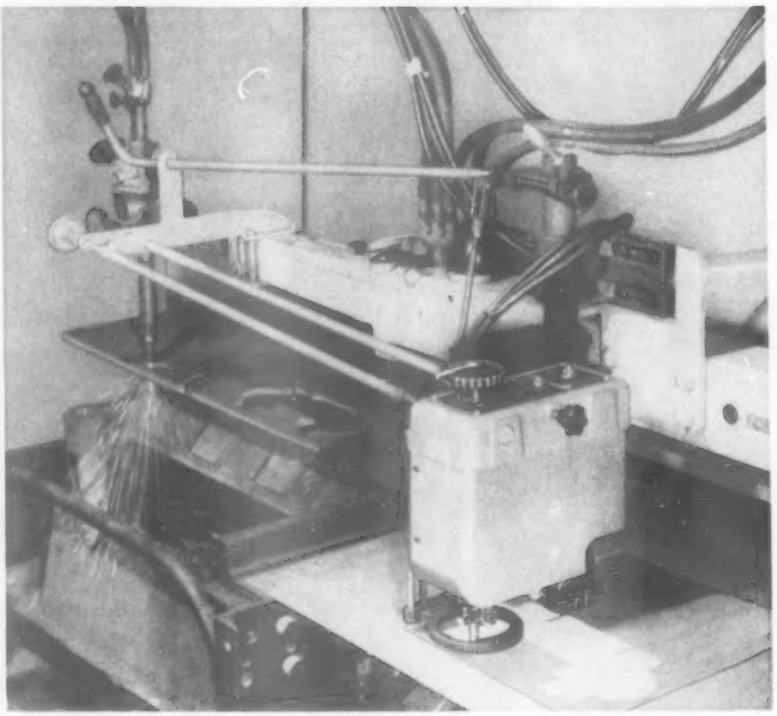

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"Mountain moving" Caterpillar machines are built to take the toughest kind of abuse that any equipment can be subjected to—delivering trouble-free service over years of service. To earn such a record, you can bet that every part, down to the smallest fastener, is engineered for thoroughly dependable performance.

Silvaloy Brazing Alloys are used successfully in brazing Bundywell, steel and copper tubing to maintain these high standards for Caterpillar-built products.

For proved low temperature silver brazing alloys, call the Silvaloy Distributor in your area. Expert technical assistance is also available there without cost or obligation, to help you speed or simplify brazing production, cut costs or improve results.

CATERPILLAR

REG. U. S. PAT. OFF.

Here are a few of the many Caterpillar Track-Type and Wheel Tractors and Earthmoving Machines that are helping to speed progress in highway and airfield construction, logging, mining and many building projects.

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Welding Arcs

Now—reliable, high-speed welding of aluminum and stainless steel*

New G-E Fillerarc Equipment makes a production reality of the consumable electrode gas-shielded welding process

Two years ago, General Electric welding engineers took on a challenging assignment: to develop equipment for consumable electrode gas-shielded welding that would be as dependable and trouble-free as conventional arc welding equipment.

Product of their success is the new G-E Fillerarc equipment which today makes available to American industry the full potential of this amazing process.

G-E Fillerarc equipment offers you:

VERY HIGH SPEED—wire speeds up to 750 in./min, highest ever on a production welder of this type.

WIDER USABILITY—far smaller wire can now be used, permitting welding of very thin sheets.

REAL DEPENDABILITY—unique design features minimize trouble, slash maintenance costs.

UNMATCHED RESULTS—current is automatically supplied for any wire speed, assuring high-quality work.

LOW PRODUCTION COSTS—due to very high speed, minimum operating trouble, increased flexibility.

EASE OF OPERATION—semi-automatic features make Fillerarc welding simple and easy to learn.

Additional information on this amazing new equipment is contained in these two bulletins:

GEA-6028 Fillerarc Welding Equipment
GER-819 Fillerarc Welding Process

They're available from your nearby G-E Welding Distributor. He's listed here and in the yellow pages of your phone book under "Welding Equipment—General Electric." Contact him today! General Electric Company, Schenectady 5, New York. 710-6

*Plus other metals including copper, nickel, and magnesium bronze.

See Fillerarc Demonstrated at National Metal Show Oct. 19th, Cleveland

GENERAL ELECTRIC

News

Information on equipment, electrodes and accessories from G.E., pioneer in arc welding

Radically new designs fulfill needs of Fillerarc process

NEW FILLERARC WELDER MINIMIZES STUBBING, BURN-BACK

Here is the first self-regulating welder. Designed specifically for consumable electrode gas-shielded welding, it has a rising volt-ampere characteristic which automatically avoids burn-back and stubbing troubles, permits changing wire speed and current without adjusting the generator.

Other features:

- Self regulation—insures proper current for any wire speed.
- Low open-circuit voltage—makes accidental burn-back unlikely.
- Controlled current surge—for easy starts without scratching.

NEW FILLERARC GUN FEEDS SMALLER WIRE BY PULLING

To overcome limitations on wire size caused by kinking, the Fillerarc gun is designed to **pull** wire into the gun. Result: the gun uses wire as small as .030 in., permitting the welding of far thinner sections than before.

Other features:

- Light in weight—50 ounces including normal unsupported cable.
- Simple trigger—for positive starts, automatic gas coverage.
- Easy threading—changing wire takes but a few minutes.

NEW FILLERARC WIRE DRIVE CONTROLS SPEED PRECISELY

To match other precision components, G-E engineers selected a G-E Thy-mo-trol† drive for accurately controlling wire feed. Remote control dial at work permits changing speed even while welding.

Other features:

- Dynamic braking — eliminates wire trimming before each start.
- Continuous wire-speed indication —no need to time and measure.
- Easily portable—weighs only 142 lb including wire, mounted on casters.

†Reg. Trade-mark of General Electric Company

Here's the name of your G-E Welding Distributor—

Alabama: Birmingham—Alabama Oxygen, Young & Vann Supply; Mobile—Turner Supply

Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo—Hendrie & Bolthoff

Florida: Hollywood—Florida Gas & Chemical

Georgia: Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen; Columbus—Williams Welding Supplies

Idaho: Boise—Olson Manufacturing

Illinois: Chicago, Moline, Morton, Rockford—Machinery & Welder

Indiana: Evansville—Drill Master Supply; Ft. Wayne, Indianapolis—Sutton-Garten; South Bend—Perry Welding Sales & Service

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Kansas: Coffeyville—Thompson Bros. Supply & Welding Equip.; Hutchinson—Kopper Supply

Kentucky: Louisville—Reliable Welding; Paducah—Henry A. Petter Supply

Louisiana: Alexandria, Shreveport—Hughes Oxygen; New Orleans—Consolidated Welding Supplies

Maryland: Baltimore—Arcway Equipment

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Michigan: Detroit—Welding Sales & Engineering; Grand Rapids—Miller Welding Supply

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Mississippi: Jackson—Jackson Welding & Supply

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Montana: Billings—Valley Welders Supply; Butte, Great Falls—Montana Hardware

Nebraska: Lincoln—Lincoln Welding & Supply; Omaha—Baum Iron

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North Carolina: Charlotte—Dixie Gases; Gastonia—Gastonia Motor Parts

North Dakota: Bismarck, Fargo—Acme Welding Supply; Fargo—Dakota Electric Supply

Ohio: Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield—Burdett Oxygen; Toledo—Odland Iron Works

Oklahoma: Tulsa—G-E Welding Sales Division

Oregon: Eugene, Portland—J. E. Haseltine; Medford, Portland—Industrial Air Products

Pennsylvania: Allentown, Philadelphia, Pittsburgh—Arcway Equipment

South Carolina: Columbia, Greenville—Welding Gas Products

South Dakota: Deadwood—Hendrie & Bolthoff

Tennessee: Chattanooga, Knoxville, Nashville—Welding Gas Products; Memphis—Delta Oxygen

Texas: Abilene—M&M Welding Supply; Alice, Corpus Christi—Crane Welding Supply; Alpine, El Paso, Marfa, Pecos—Car Parts Depot; Amarillo, Hereford—Tex-Air Gas; Brownsville, Harlingen—Acetylene Oxygen; Dallas—Hill Equipment & Supply; Houston—G-E Welding Sales Division; Lubbock—Welders Supply of Lubbock; Midland—West Texas Welders Supply; Odessa—Western Oxygen; Pecos—Welding Supply Co.; Plainview—Plains Welding Supply; San Angelo—Southwestern Welding Supply; Snyder—Western Welding Supply; Texarkana—Hughes Oxygen; Wichita Falls—Nortex Welding Supply

Utah: Salt Lake City—The Galigher Co.

Virginia: Richmond—Arcway Equipment

Washington: Seattle, Spokane—J. E. Haseltine; Spokane, Yakima—Industrial Air Products

West Virginia: Bluefield—Bluefield Supply; Charleston—Virginian Electric; Huntington, Logan—Logan Hardware & Supply

Wisconsin: Milwaukee—Machinery & Welder

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CROSS OUT CONTAMINATION AND SAVE WITH ZIRTUNG ELECTRODES

Work right ahead without interruption with Sylvania's new Zirtung electrodes!

This improved tungsten-zirconium rod really licks the contamination problem and lasts longer on any job. Saves time, saves electrodes and assures sound, dependable welds. Wonderful for mild steel, stainless steel, aluminum, and magnesium. If your nearest Sylvania Welding Distributor can't supply you, write today to: Sylvania Electric Products Inc., Dept. 3T-4310, 1740 Broadway, New York 19, New York.

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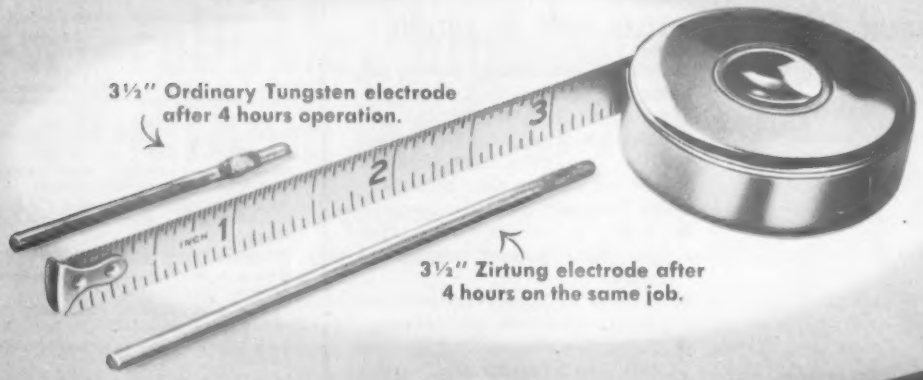

Here's why Zirtung saves:

1. **Greatly reduces electrode consumption.**
2. **Less contamination from material being welded.**
3. **Self cleans contamination without loss of electrode.**
4. **Greater arc stability.**

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine St. Montreal, P. Q.

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Available in all piping materials!

ALLOY OR NON-FERROUS PIPING is often the answer to problems of contamination, corrosive action, severe pressures and temperatures, or cyclic operation. You can obtain TUBE-TURN Welding Fittings and Flanges of stainless steels, nickel and nickel-base alloys, copper and copper-base alloys, aluminum and aluminum-base alloys, and newest of all, titanium. For good service in welding fittings, in carbon steels, or in alloy or non-ferrous metals, call your nearby TUBE TURNS' Distributor. He's ready to serve you from industry's most complete line.

The Leading Manufacturer of Welding Fittings and Flanges

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ENGINEERING SERVICE

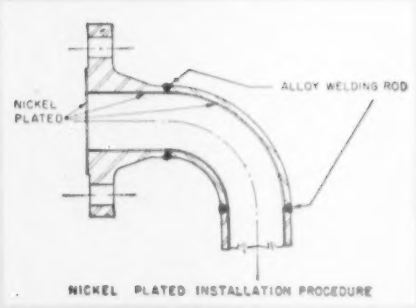
TUBE TURNS' *Engineering Service*

can help you cut cost of corrosion-resistant piping

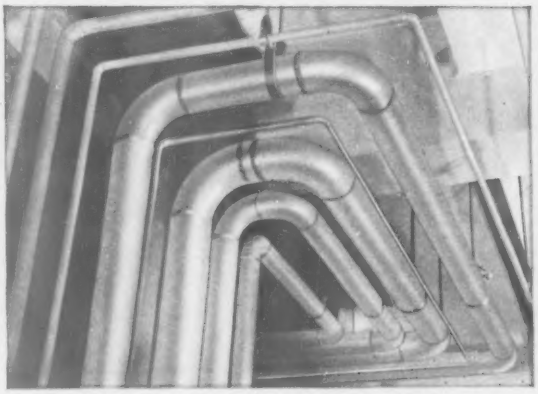
G. A. GAUM is one of TUBE TURNS' Engineering Service Division men spending a great deal of time in the field obtaining performance data that contributes to improved piping technology.

THE COST of corrosion-resistant piping can often be minimized by the use of standard carbon steel piping *plated* on the inner surface with such materials as nickel, copper, etc. In atomic energy plants, nickel-plated piping in sizes through 42" is giving satisfactory service, and has substantially reduced original cost. The method is also applicable to many industrial processes where corrosion resistant materials are specified.

Such plating is generally .008" thick, and can be applied in heavier thicknesses where desirable. You can obtain recommendations on preferred plating sources, proper welding techniques and rods from TUBE TURNS' Engineering Service—always ready to help you with special piping problems.



Installation procedure for nickel plated welding fittings and flanges.



These welded aluminum lines, fabricated with TUBE-TURN Welding Fittings, are permanently leakproof, reducing maintenance to a minimum. Since Tube Turns, Inc. offers the world's broadest line of welding fittings and flanges, all necessary types of welding fittings for any job can be obtained from one reliable source.

Dimensional accuracy of TUBE-TURN Welding Fittings speeds fabrication in the shop or in the field. True circularity and uniform wall thickness assure perfect alignment. Each TUBE-TURN welding fitting is individually examined by skilled inspectors for accuracy.

Want Piping Information?

TUBE TURNS, INC. is recognized the world over for its leadership, not only in the field of welding fittings and flanges, but as a source of authentic information on piping design. Check the coupon below for bulletins you would like to receive.

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224 East Broadway, Louisville 1, Kentucky

Please send me free copy of:

- ☐ Special Alloys
- ☐ Pipe and Fitting Materials
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Penoptic products are manufactured and distributed by the Pennsylvania Optical Company . . . one of America's foremost producers of fine ophthalmic goods since 1886. These sixty seven years of experience, as applied to the production of Penoptic safety products, makes them quality leaders in the safety equipment field. You can order Penoptic safety products direct, for better service at a substantial reduction in cost of worker protection to you, the purchaser. And by dealing with the manufacturer you enjoy a closer association with the people who are directly responsible for product performance.

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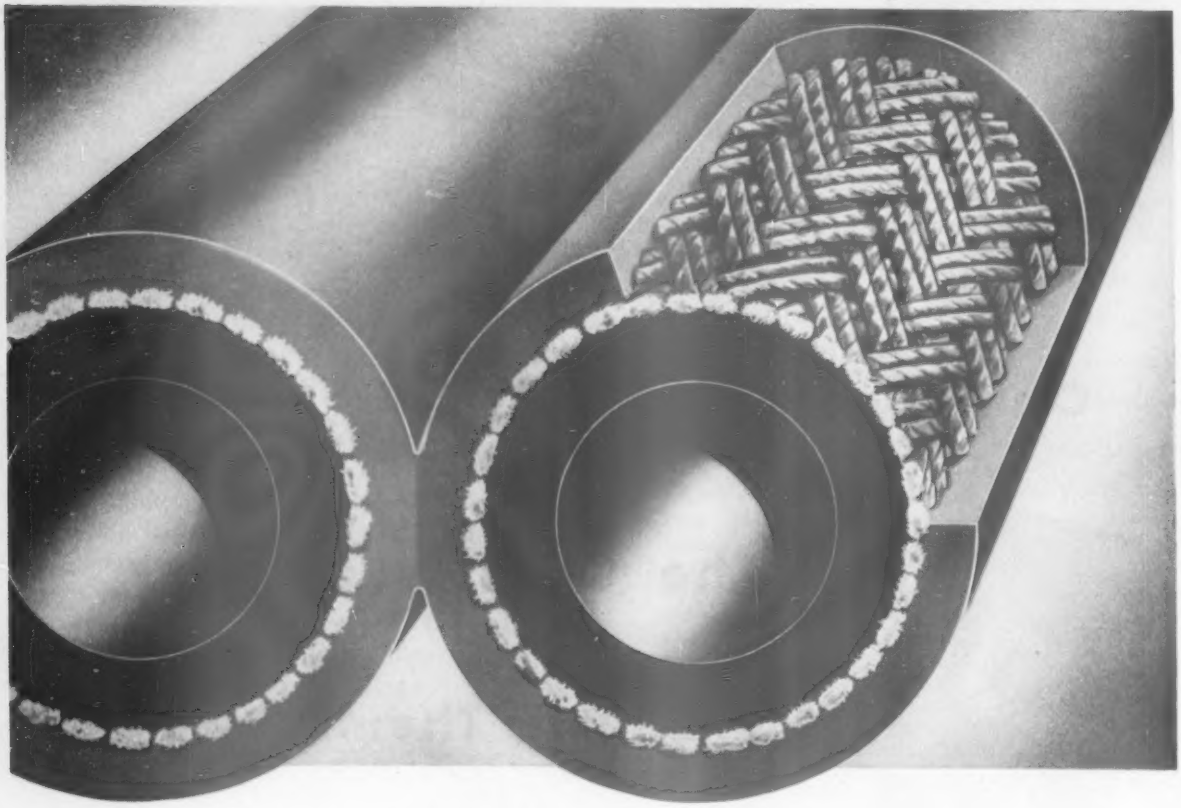
TWIN-WELD . . . Now Four Ways Better



Hewitt-Robins Twin-Weld Hose Offers Values Found in No Other Welding Hose

Twin-Weld®—the original twin-line welding hose, preferred by over 7 out of 10 users—is now four ways better.

Twin-Weld is non-porous . . . it eliminates welding inefficiency, explosions and fires.

Twin-Weld has a greater ease of handling . . . eliminates tangling, assures flexibility. Twin-Weld has the important advantage of being a "straight-cure" hose; it won't snake.

Twin-Weld eliminates tangled lines. Its two lines are firmly bonded together, yet easily separated by cutting with a knife.

Twin-Weld Hose incorporates principles of construction and methods of manufacture which are exclusive with Hewitt-Robins. It is safer, longer-lasting and now has a new neoprene flame-resistant cover.

O.D.'s now conform to IAA specifications—7/16", 17/32", 19/32" . . . I.D.'s 3/16", ¼", 5/16".

Get the facts about Hewitt-Robins Twin-Weld Hose. Write for Bulletin No. H-4a. Or contact your local Hewitt Rubber Distributor (see "Rubber Products" Classified Phone Book).

HEWITT HR ROBINS

Executive Offices, Stamford, Connecticut

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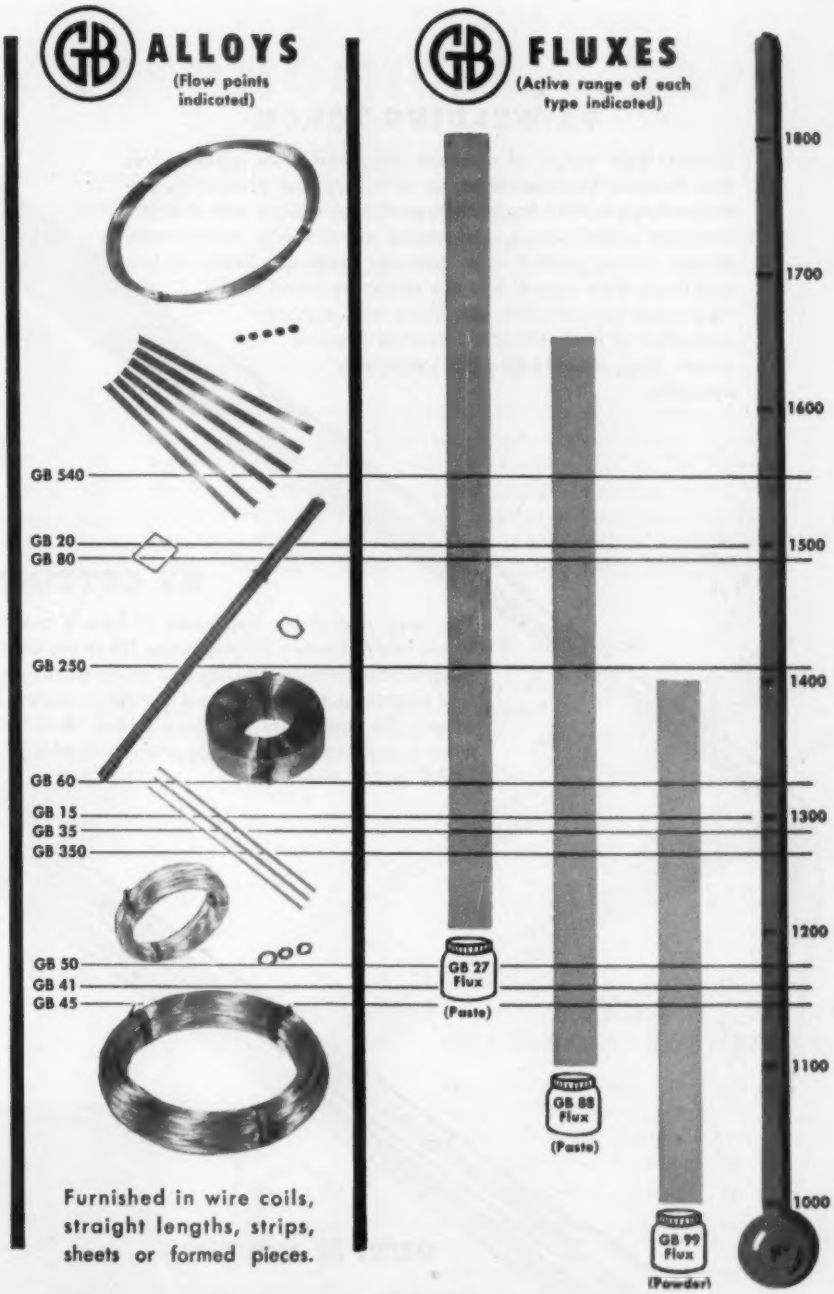
FACTS ABOUT GB BRAZING ALLOYS AND FLUXES . . .

YOU BE THE JUDGE!

There is one sure way for you to learn just how GB Alloys and GB Fluxes team together to give maximum results on low temperature brazing applications—that is; try them in your own shop and on your own specific jobs.

Yes, here's the reason why we say, "You Be The Judge!"—try GB Alloys and Fluxes on a no-cost, no-obligation basis. Simply write to Goldsmith Bros., Silver Brazing Division, 5841 So. Throop St., Chicago 36, Ill. We will notify your nearest GB Distributor that you want "working" samples. In addition to furnishing samples, your GB Distributor is always available to give you competent assistance in the practical applications of low temperature silver brazing.

GB 22 Flux is a high temperature brazing flux with an active range of 1200°F to 2000°F. Exceptionally fine powder makes up into a smooth paste when mixed with water. Low glare and non-fuming at any heat.



Furnished in wire coils, straight lengths, strips, sheets or formed pieces.

Free! GB Samples

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REGO* Welding and

GX WELDING TORCH

Extreme light weight of aluminum alloy body and handle gives fine balance, increases operator efficiency and production. Exclusive Rego handle construction gives high rigidity and strength. Easy-turn valve wheels, non-seizing monel metal valve stems. Mixers assure perfect gas mixtures, eliminate flashbacks and leaks. Pure copper tips are mirror burnished inside to provide non-turbulent, soft flame with high concentration of heat. Other construction features assure long, trouble-free life with safe operation.

KX CUTTING TORCH

This torch also shows the results of Rego's quality construction. Valve body of heavy forged brass. Tubes are of stainless steel in rugged triangular construction that really stands abuse. Head is of heat resistant stainless steel and resists scoring action of grit. Tip and mixer combined in one, therefore mixer is individually correct for each tip. Choice of 75° or 90° head.

OUTFIT NO. 71K

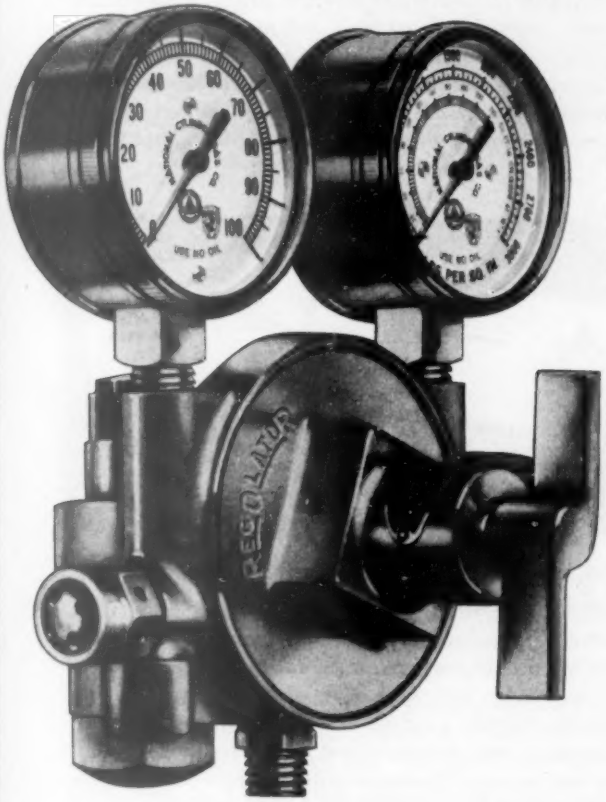
All-purpose, heavy duty industrial combination for welding and cutting. Includes GX Torch Handle, four GX tip assemblies, two Rego Two-stage regulators, easy-connect cutting attachment with cutting tip, hose, wrenches, lighter and goggles.

*T. M. of the B. B. Co. Chicago

Cutting Equipment

PRODUCTIVE...ECONOMICAL...SAFE

Thousands upon thousands of plants and shops the country over are using productive, profitable, time-and-money-saving Rego equipment in their oxy-acetylene welding and cutting operations. You will find this equipment superior in handling and operating characteristics, dependable and safe in use—factors that will reflect favorably in your production and cost records. And these factors explain why Rego has been so highly regarded in the industry for so many years. See Rego equipment at your nearest NCG branch or authorized NCG dealer. Or use the coupon below.



REGO TWO-STAGE REGULATOR

Built to provide unvarying working pressures, easy adjustment, and long, trouble-free life. Rego two-stage design maintains pressure uniformly, unaffected by dropping cylinder pressure. The way the regulator is *set* is the way it *stays*. Compound springs permit very fine pressure adjustment. Body and bonnet of heavy forged bronze. Cartridge filter strains out rust and dirt and radiates recompression heat rapidly and harmlessly into body. Automatic safety relief valve.

BANTAM® WELDING TORCH

An amazingly efficient torch for a wide range of light metal welding: aluminum, alloys, steel from 28 gauge to ⅜". Featherweight yet durable.

KXA CUTTING ATTACHMENT

Use with any Rego GX torch handle. Double duty at minimum outlay. Durable bronze alloy head and tubes. Range of tips cuts steel up to 6" thick.

REGO ECONOMIZER

Gives automatic shut off when you hang torch on hook. Relights by passing tip over pilot light, to previous flame setting. Saves gas, saves time.

NCG®

EVERYTHING FOR WELDING

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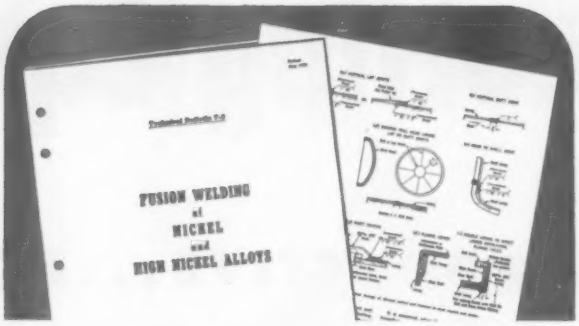
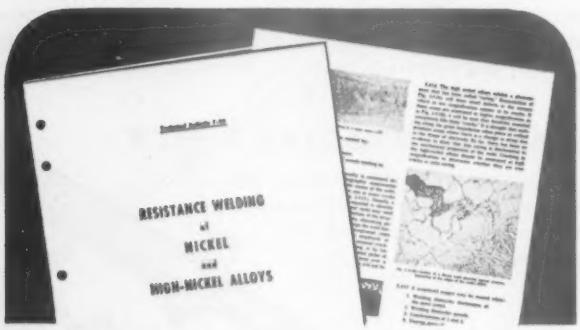


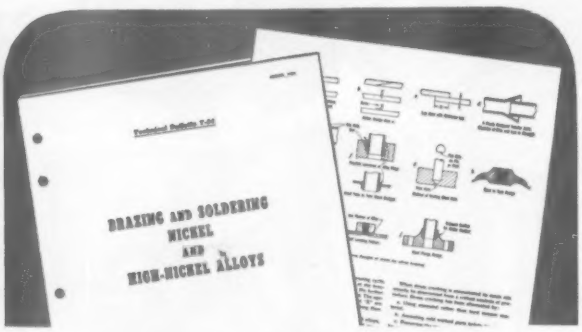
T-2, "Fusion Welding of Nickel and High-Nickel Alloys"

T-2 covers surface preparation, joint designs, jigs and clamps, electrodes, current, pre-heating, flux and welding procedures for metal arc and gas arc welding. It discusses overlays on cast iron and joining of dissimilar metals; and the preparation, application and testing of linings. It contains tables of chemical analysis, mechanical and physical properties and electrode requirements. Illustrated with diagrams and photographs.



T-33, "Resistance Welding of Nickel and High-Nickel Alloys"

T-33 covers design and equipment considerations, welding procedures (both for similar and dissimilar metals), checks for defects and tests for spot, seam, projection and flash welding. It also covers resistance brazing. It gives tables on chemical analysis and mechanical and physical properties, and recommended conditions for welding. Illustrated with diagrams and photographs.



T-34, "Brazing and Soldering Nickel and High-Nickel Alloys"

T-34 covers design, surface preparation, fluxes, heating methods, post brazing treatment and inspection for silver and copper brazing. Also contains tables on properties and formulae and a section on soft soldering. Latest data on methods and materials used in brazing for high temperature service, illustrated with photographs and diagrams of joint and edge reinforcement design.

When it's a question of welding cast iron . . .

Inco's latest folder on Ni-Rod "55"® gives helpful tips on making sound, machinable welds in cast iron, Ductile Iron, Ni-Resist®, special alloy irons, and joining cast iron to other metals. Write today for this folder and any others you need.

Discuss your welding problems with Inco's welding engineers at the National Metal Exposition, October 19-23. (Booth 332, Public Auditorium, Cleveland, Ohio)

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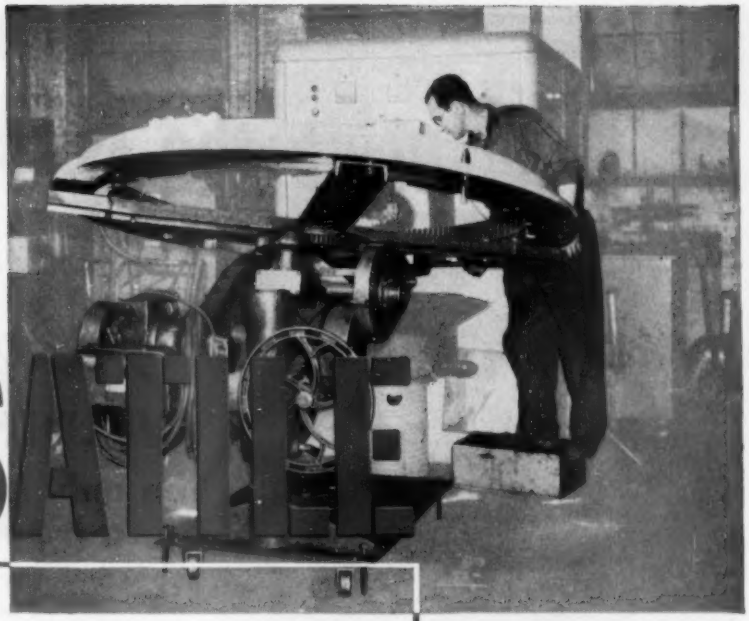
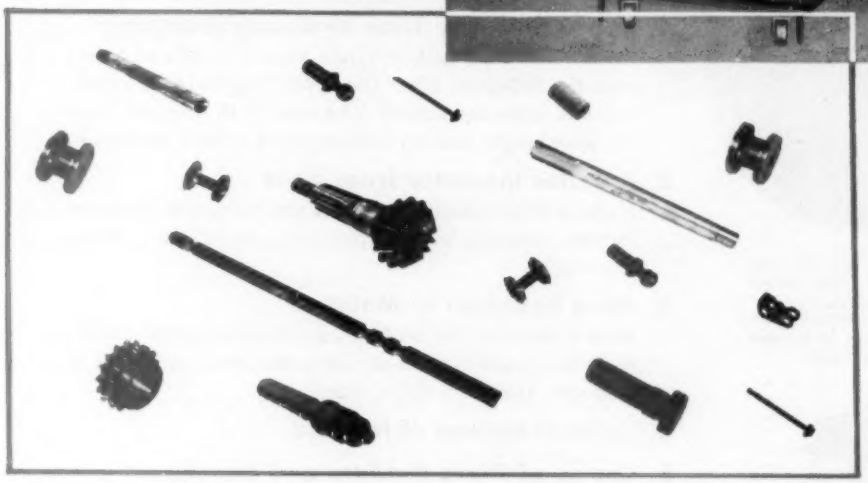


"Internal ring gear being hardened on the Lindberg LI-25 Induction Heating Unit".



Investigate the amazing versatility of the Lindberg Induction Heating Unit—approximately 2000 different parts have been selectively hardened or annealed on this typical commercial heat treating installation.

FROM THE LARGEST—The internal ring gear illustrated above—with a 60" inside diameter, 3½" face with 187 teeth each individually heated and oil spray quenched.

TO THE SMALLEST—This small 2" stamped metal rocker arm was selectively heated and water quenched on the small square face at the rate of 3000 per hour. Investigate this versatile Lindberg Induction Heating Unit—it may supply the answer to your selective heating operations.

SPECIFY LINDBERG

for any heat treating or melting need! Lindberg manufactures every type and many sizes of melting and heat treating furnaces from tiny laboratory units to mammoth field erected installations—whether it's gas, oil, electric, arc, low or high frequency—consult your local Lindberg Office!

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HIGH FREQUENCY DIVISION

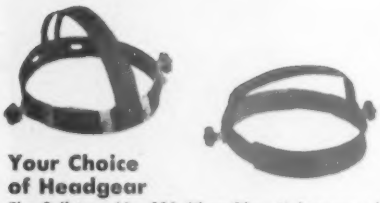
LINDBERG ENGINEERING COMPANY

2477 W. Hubbard Street • Chicago 12, Illinois

Announcing the NEW amazing SELLSTROM *Fiber Glass* WELDING HELMET

The only helmet with these advanced features

Because of its greater strength and water resistance, the new Sellstrom No. 230 Fiber Glass Helmet should outlast 5 ordinary fiber helmets.
It is available with either the Standard Front Loading Plate Holder, as shown above, or the new "S" Lift Front Plate Holder shown below.



Your Choice of Headgear

The Sellstrom No. 230 Fiber Glass Helmet may be fitted with either the Standard Headgear No. WMXK shown above or the new Sel-O-Matic "M" model headgear shown at the right — which can be easily adjusted with one hand while the helmet is on the head.

1. 400% Stronger Than Ordinary Helmet
An 8 ounce steel ball, dropped from a height of 5 feet onto the Sellstrom Fiber Glass Welding Helmet, merely bounced from the helmet. The same ball, dropped from the same height onto an ordinary fiber helmet, cracked it.

2. A Better Insulator from Heat
Made of Fiber Glass, the perfect insulator, this Sellstrom Helmet transmits less heat than ordinary helmet — keeps face cooler.

3. More Resistant to Moisture
After immersion for 48 hours in salt solution of 160°F., the Fiber Glass Helmet absorbed less than ½ ounce of moisture. Holds its shape indefinitely.

4. Lightest Helmet of Its Kind

5. Choice of Plate Holders and Headgear

TEST A SAMPLE — Satisfaction Guaranteed!

Let us ship you a sample Sellstrom No. 230 Fiber Glass Helmet equipped with the famous Sel-O-Matic headgear and the new "Lift Front" plate holder on a 30 day memo, with the understanding that if you are not entirely satisfied, you can return it for credit. We will also give you the name and address of a nearby dealer who can supply your future requirements. The price — no higher than for an ordinary quality helmet. Send for your sample today!

Ask your dealer or write us for a copy of this 60 page buying guide to more than 300 Eye and Face Safeguards.

Mr. Dealer: The interchangeability of headgears and plate holders for this new Sellstrom Fiber Glass helmet means maximum profit and minimum inventory for you. Write for details!

sellstrom safeguards
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Designed for COMFORT

SELLSTROM MANUFACTURING COMPANY
622 North Aberdeen Street · Chicago 22, Illinois

longer die life,

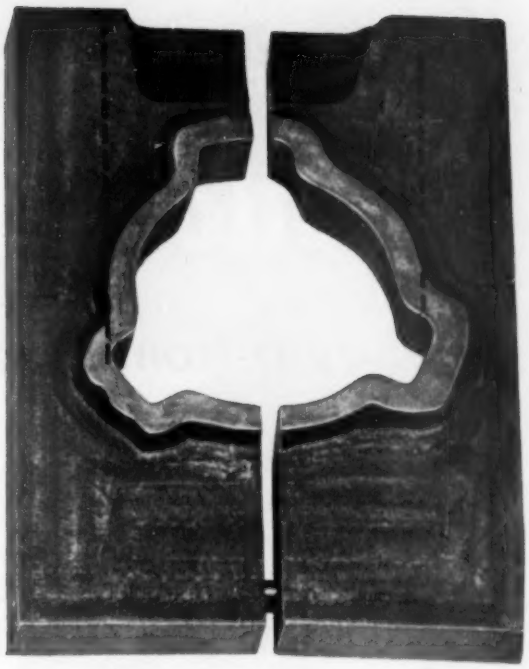
increased production,

lower costs, with

REXWELD

hard surfacing

welding rods



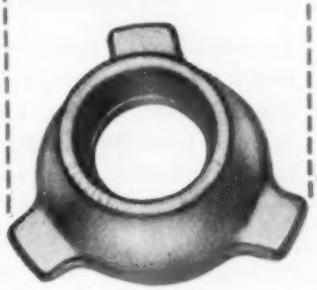
Consolidated Industries, Inc., West Cheshire, Connecticut, greatly increased die life and lowered production costs by hardfacing hot trim dies with Crucible REXWELD.

Rexwelded dies give higher edge strength at elevated temperatures, resist chipping and deformation, and keep clean, sharp cutting edges . . . all of which means longer, more efficient service from an expensive die.

Rexwelding reduces rejects to a minimum, too. This is particularly important when working alloy steel or critical material such as the highly stressed aircraft housing bearings shown above. These were produced from Rem-Cru RC 70 Titanium to close tolerances.

Use REXWELD for *all* your hard surfacing jobs. Surfaces can be Rexwelded many times — greatly increasing the service life of the part. REXWELD Hard Surfacing Rods are available in both bare rods and low hydrogen coated electrodes, in a wide selection of grades and sizes to fit your specific application.

Aircraft housing bearing forged of Rem-Cru RC 70 titanium. (A) Trim die; (B) Forging.



Visit us at Booth 241, National Metal Show, Cleveland, Ohio, October 19-23

CRUCIBLE first name in special purpose steel

53 years of Fine steelmaking

REXWELD HARD SURFACING ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MAX-EL MACHINERY • SPECIAL PURPOSE STEELS

You can make it yourself, like this...

or buy it from Mallory, like this...

and get a better tip for less money

"Home made" resistance welding electrodes can be expensive—not only because of the time they cost but also because of limited strength, poor conductivity and inadequate cooling.

Both double and single bend electrodes in a wide range of shapes are available from Mallory stock. They are cold formed, from full hard rod stock, retaining maximum physical and mechanical properties... and with cooling tubes bent in place* to bring effective cooling close to the welding face. All this means long electrode life for uninterrupted production runs.

Don't resort to makeshift arrangements for your welding applications, no matter how special they are, until you check with Mallory. Holders and electrodes are available in a wide variety of shapes and sizes from stock ... standard parts that can be combined to handle practically any job. Ask your Mallory Distributor, or write us directly, for your copy of Catalog 550C. See for yourself the almost limitless combinations of standard welding items that are quickly available.

Expect more...
Get more from MALLORY

In Canada, made and sold by Johnson Matthey and Mallory Ltd., 110 Industry Street, Toronto 15, Ontario

Resistance Welding Electrodes, Holders, Dies, Rods and Bars, Castings, Forgings

*Patent No. 2489993

P.R. MALLORY & CO. Inc.
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SERVING INDUSTRY WITH THESE PRODUCTS:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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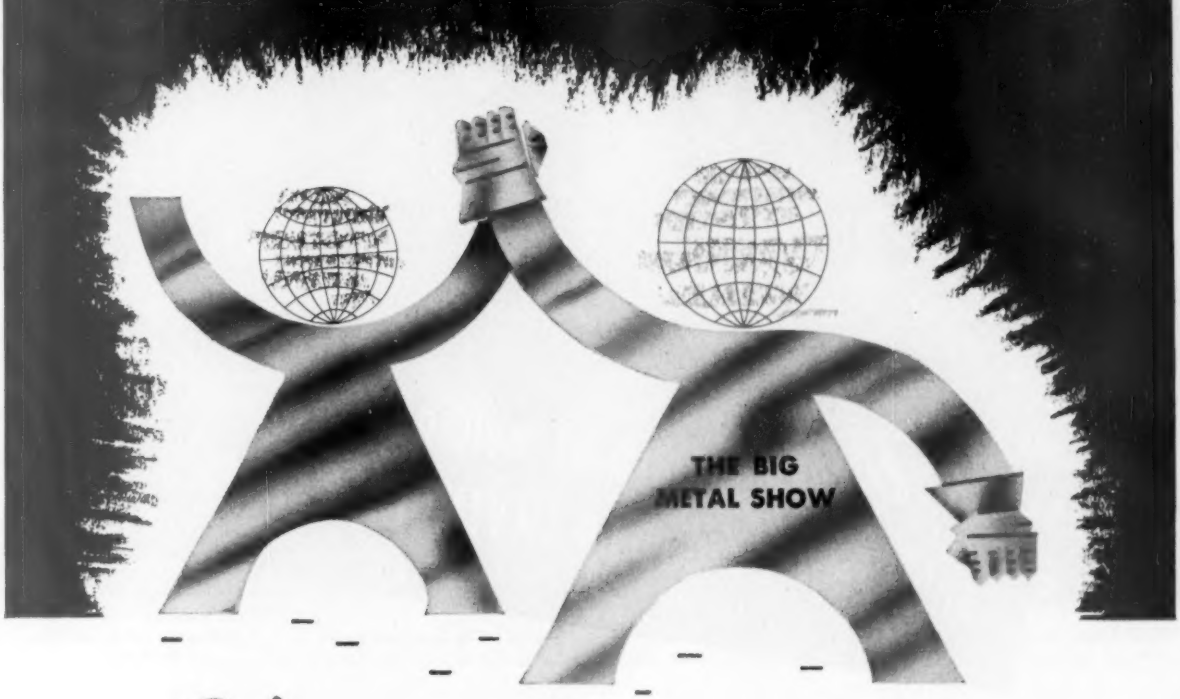
P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

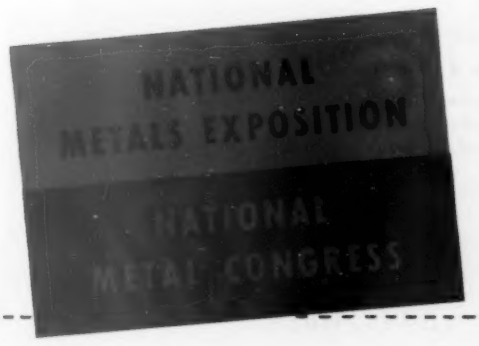
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

NATIONAL METAL EXPOSITION

THE BIG METAL SHOW

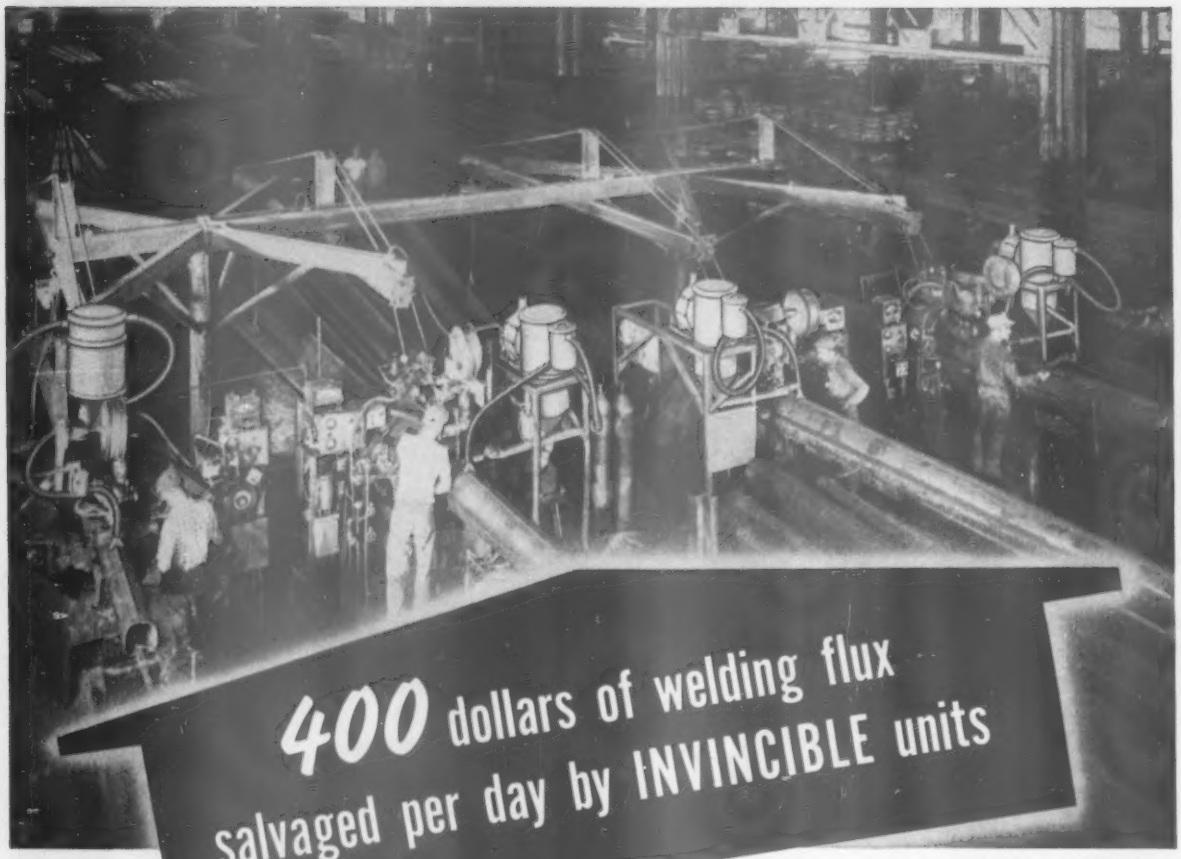


Champion – in the Metals Market Place of the World!



Unmatched anywhere in the world for intensity of interest . . . for wealth of ideas and basic appeal . . . the National Metal Exposition in Cleveland's Public Hall this October, will be host to another record-breaking audience of metals industries people . . . intent upon seeing the newest . . . the finest . . . the most wanted developments America's industrial genius has created. For every man interested in metals, this champion of all industrial expositions offers *more of everything!*

CLEVELAND, OHIO • OCTOBER 19-23



400 dollars of welding flux salvaged per day by INVINCIBLE units

See Invincible Units at the National Metal Exposition Booth 2774

Steel street lighting standards totaling almost **three miles** in length can be welded in a day by **The** Union Metal Mfg. Co., Canton, Ohio. A **battery** of five Invincible Flux Recovery Units *automatically* salvages the unfused flux from **this submerged** arc welding. The flux recovered in a three shift operation is valued at four **hundred** dollars.

Manual salvage would involve many costly **man-hours,** and the probability of less efficient **separation** of the re-usable flux from the fused particles and fine dust.

Working practically 'round the clock for over **four years,** these Invincibles have required a minimum of repairs, even though the material handled is highly abrasive.

Available in many sizes and types, the complete line of Invincible Recovery Units offers the *right* model for every kind of submerged arc welding job...To apply the equipment to your needs, Invincible's unexcelled experience in this specialized field is at your service.

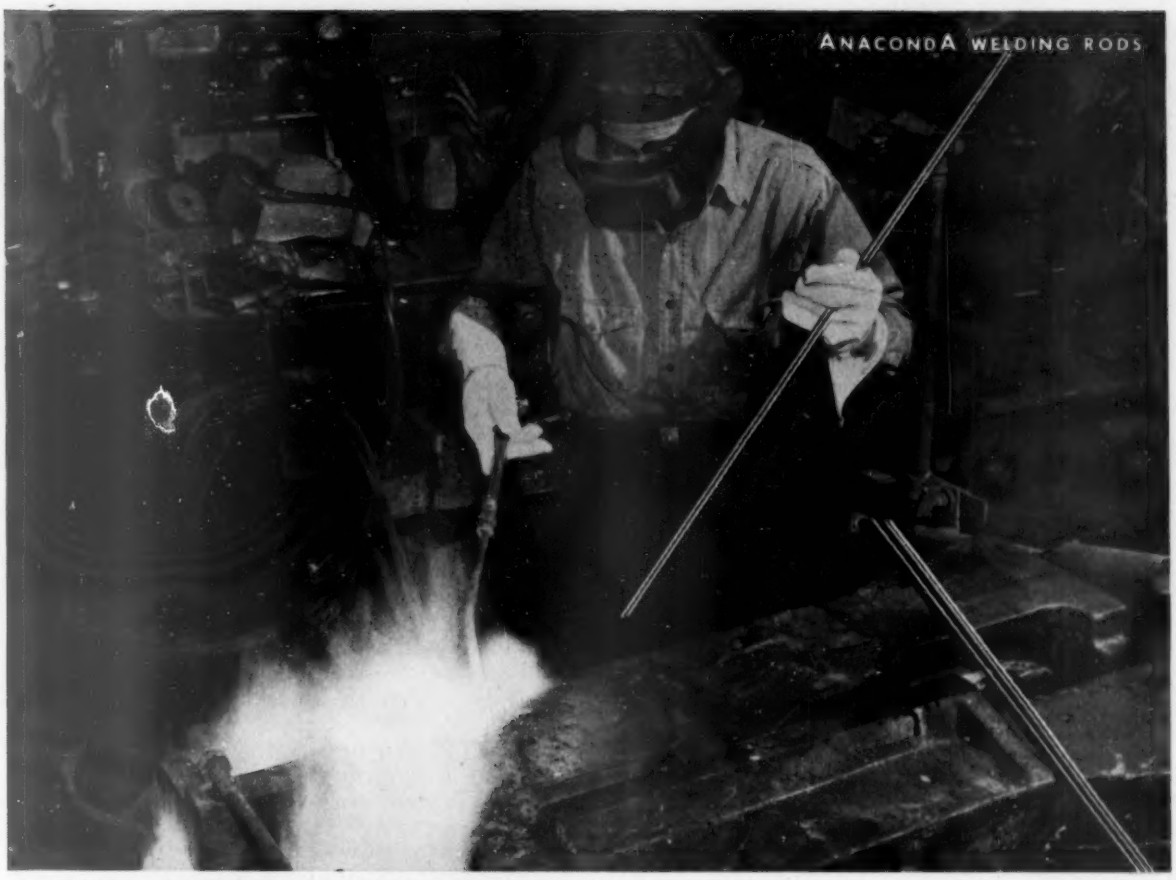
Free Folder on Flux Recovery

Describes and illustrates the complete Invincible line ...Send for your copy *now.*

INVINCIBLE VACUUM CLEANER MFG. CO.

DOVER, OHIO

FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT



REX'S WELDER, John Magliocco, uses ANACONDA-997 (Low Fuming) Bronze Welding Rods to repair a cast iron side frame from punch press. The Rex shop braze welds all kinds of industrial machinery—lathes, presses, rollers, gear teeth, ink grinding plates, etc.

"We cut welding time—costs, too—with AnacondA Bronze Welding Rods"

— says Everett Rex, co-owner Rex Auto Radiator & Welding Company, Chicago

MR. REX points to finished weld.

"WHEN 40% of your business is braze welding, you're mighty particular about the rods you use," continues Mr. Rex. "You want a rod that's easy to work with, gives fast, sound welds . . . keeps costs down. After trying them all, we chose ANACONDA Bronze Welding Rods. They melt at lower temperature. Castings don't distort because they need less preheating. ANACONDA Rods flow freely . . . tin easily. We get faster, smoother welds that need little finishing. We've found economy in them, too. Since they require less heat to apply, less time is spent on the welding operation. We estimate braze welding to be 50% faster than ferrous rod welding."

The Rex Auto Radiator & Welding Co. buys ANACONDA Welding Rods from the Machinery & Welder Corp., Chicago, who are always ready to lend a hand on tough welding problems—as is your own distributor. ANACONDA Welding Rods are available from distributors throughout the United States and Canada. For latest tips on welding techniques, write for Publication B-13. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 53161

braze or weld with confidence—

ANACONDA®

welding rods

The Reader AUDITED PAID ABC CIRCULATION *His Mark*

THE ABC that appears in the symbol at the top of this page stands for Audit Bureau of Circulations. The symbol itself is an emblem of cooperation, in which every subscriber to this magazine has an interest.

The Audit Bureau of Circulations is a voluntary, non-profit, cooperative association. It was founded in 1914 and now consists of 3450 advertisers, advertising agencies and publishers in the United States and Canada. This magazine is proud to be a member.

ABC originally was set up to help take the racket out of publishing, to eliminate the waste and guesswork then so prevalent in publishing and advertising, to establish order and confidence in place of the misunderstanding and misrepresentation that arose from unverified circulation claims and dubious circulation practices. Its mission was to protect the interests of both readers and advertisers.

THIS IT DID by first defining the term "paid circulation." Then it established standards and rules to govern subscription sales practices and records. Finally it set up an auditing organization to verify the claims and report the facts concerning the circulation of each member publication. It now maintains on that job a working staff of sixty-five full-time auditors. So the ABC symbol has become the hallmark of circulation standards and advertising values. Each member publication must maintain those standards if it wishes to retain its membership and display the ABC symbol.

This ABC audit is no perfunctory affair. When a business publication, such as this one, becomes a member of the Bureau, it agrees that the auditors shall have "the right of access to all books and records." Their inspection, therefore, may cover any part of its operations. Original subscription orders, payments from subscribers, paper purchases, postal receipts, arrears of payments, and many more items are painstakingly checked by the auditors. In many instances they go behind the records to seek verification from subscribers themselves as to the terms of their subscriptions.

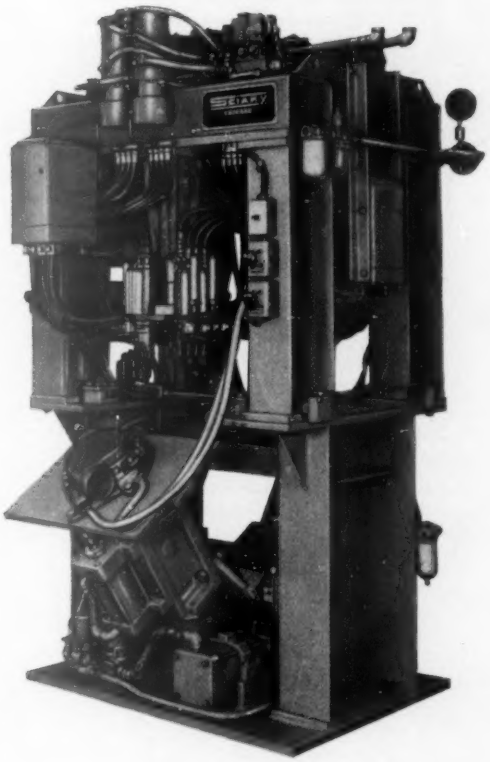
IN DOING ITS JOB, ABC has created many values for both publishers and readers as well as for advertisers. That is because the publication that becomes a member of ABC thereby offers the strongest possible guarantee of its primary devotion to the interests of its readers. The function of a business magazine is to be useful to its readers. When this service is rendered by an ABC publication, it is constantly subject to the practical test of reader acceptance and approval. As each subscriber has the right to purchase or refrain from purchasing an ABC publication, that collective right confers upon the readers the power to say whether or not the publication will survive. Thus the report on its ABC audit provides the most direct assurance that a publication stays in business only because of a voluntary demand by readers who find its editorial service responsive to their needs.

Naturally, the editor of each business publication follows closely the score thus racked up by his paper in its ABC reports. In the scope and tone of his editorial coverage and treatment, in the selection and presentation of his editorial content, he must constantly labor to maintain and enhance the readers' acceptance of his efforts. That is why the editorial standards established by ABC publications set the editorial standards for all publishing. That is how the ABC constantly stimulates its member publications to become even more useful to their readers.

AND THAT IS WHY the ABC symbol has become the Mark of the Reader, a constant reminder that his willingness to pay for an ABC publication is the acid test of its value both to him and to its advertisers.

McGraw-Hill Publishing Company

NEW
HIGH PRODUCTION WELDER
READILY ADAPTABLE TO
PRODUCTION CHANGES



The Sciaky Standard SX Electric Resistance Welder equipped as a 36 Gun Unit for welding blower housings at the rate of 500 per 50 minute hour.

New Sciaky Standard Multiple Gun Welder Designed for Wide Variety of Production Applications

High production, multiple gun applications no longer require uneconomical C-frame type electric resistance welding machines with special tooling, or complex, specially designed, one-job machines.

Now, Sciaky, pioneers and inventors of electric resistance welding machines, offers a standard multiple gun welder that can be readily adapted for production changes within the capacity of the machine.

The Sciaky SX Welder, a dual platen unit, mounts simple superstructure providing for different arrangements of standard transformer, booster, and welding electrode units.

With approved J. I. C. controls, and featuring either independent or simultaneous dual platen operation, the Sciaky SX Welder offers all the advantages of high production, precision welding, *plus* the tremendous economies of adaptability to production changes.

For complete information, write for Bulletin 313-12.

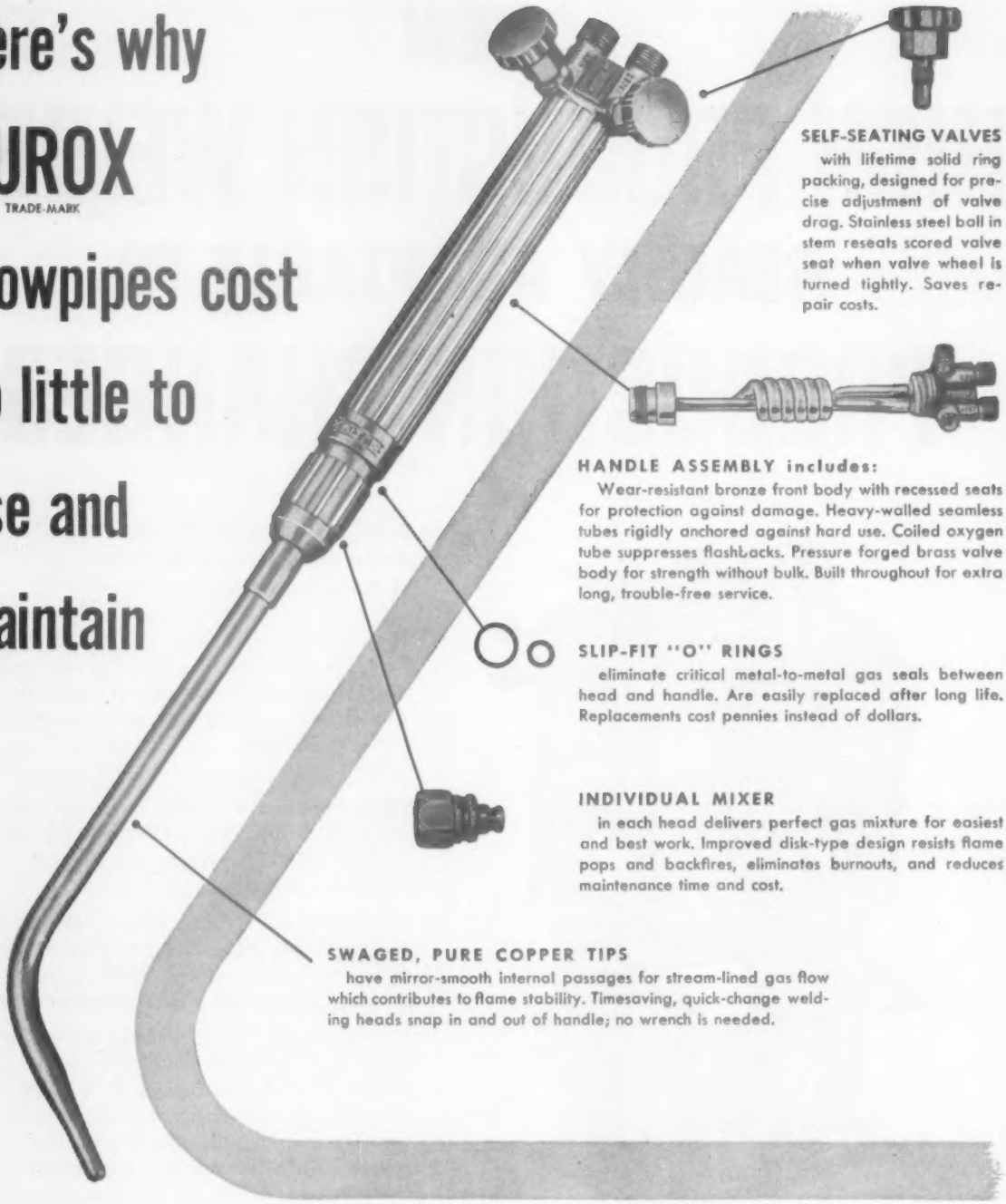
Preview new Sciaky welders at Booth 2106 National Metals Show, Cleveland, Oct. 19-23.

Largest Manufacturers of Electric Resistance Welding Machines in the World

SCIAKY

Plants: Chicago • London • Paris Sales Offices: Chicago, Ill. • Buffalo, N. Y. • Cleveland, Ohio • Dayton, Ohio • Detroit, Mich. • Ft. Worth, Texas • Hollywood, Calif. • New York, N.Y. • Philadelphia, Pa. • Washington, D.C.

Here's why PUROX TRADE-MARK Blowpipes cost so little to use and maintain



SELF-SEATING VALVES
with lifetime solid ring packing, designed for precise adjustment of valve drag. Stainless steel ball in stem reseats scored valve seat when valve wheel is turned tightly. Saves repair costs.

HANDLE ASSEMBLY includes:
Wear-resistant bronze front body with recessed seats for protection against damage. Heavy-walled seamless tubes rigidly anchored against hard use. Coiled oxygen tube suppresses flashbacks. Pressure forged brass valve body for strength without bulk. Built throughout for extra long, trouble-free service.

SLIP-FIT "O" RINGS
eliminate critical metal-to-metal gas seals between head and handle. Are easily replaced after long life. Replacements cost pennies instead of dollars.

INDIVIDUAL MIXER
in each head delivers perfect gas mixture for easiest and best work. Improved disk-type design resists flame pops and backfires, eliminates burnouts, and reduces maintenance time and cost.

SWAGED, PURE COPPER TIPS
have mirror-smooth internal passages for stream-lined gas flow which contributes to flame stability. Timesaving, quick-change welding heads snap in and out of handle; no wrench is needed.

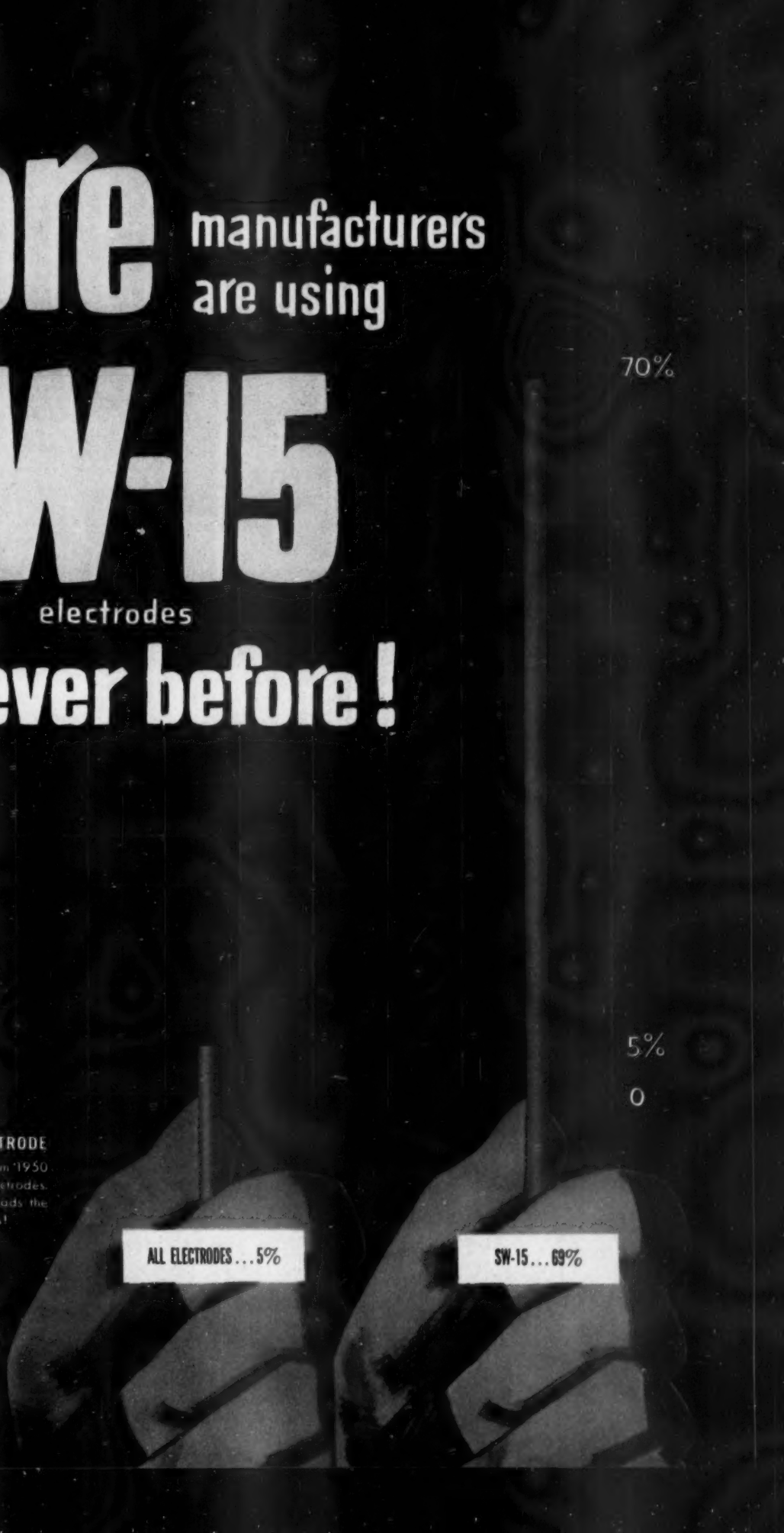
The PUROX W-202 Blowpipe (illustrated) is for all-purpose welding and heating of any metal from 32-ga. sheet to plate or castings 1 in. and over in thickness. Available with your choice of standard welding heads in 13 sizes and multiflame heating heads in 3 sizes, all of the snap-in type. All heads have an amazing resistance to flashbacks, flame pops, backfires, and burnouts. Ask your LINDE jobber for a demonstration now. Or for further information, write to LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. In Canada: Dominion Oxygen Company, Limited, Toronto.

GET IT FROM YOUR

LINDE JOBBER

The terms "Linde" and "Purox" are registered trade-marks of Union Carbide and Carbon Corporation.

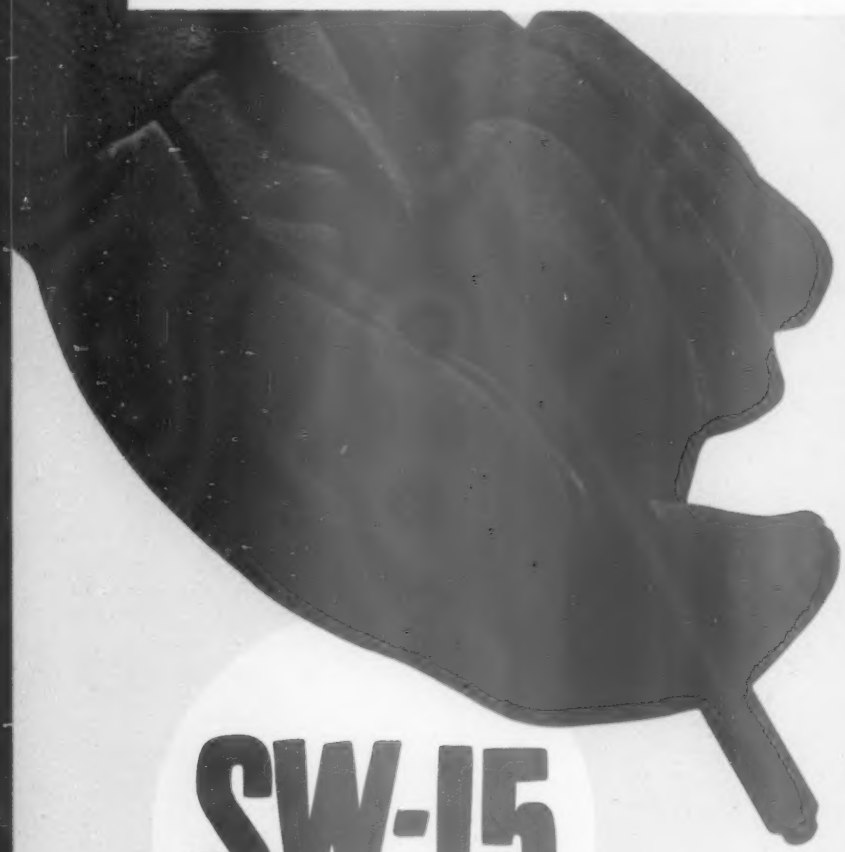
more manufacturers are using SW-15 electrodes than ever before!



FASTEST GROWING ELECTRODE

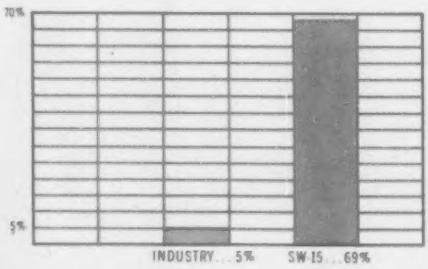
The chart shows the increase, from 1950 through 1952, in shipments of electrodes. And the A. O. Smith SW-15 leads the industry's increase by 13.2 times!

more manufacturers are using SW-15 electrodes than ever before!



SW-15

the UNIVERSAL Electrode

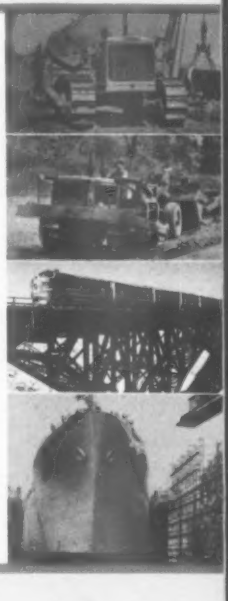


Here is the evidence of SW-15's growing acceptance among manufacturers who depend on welding in the fabrication of their products. SW-15 showed a 69% increase in acceptance and use, as compared with but 5% for all electrodes produced by the welding electrode industry from 1950 through 1952.

A few of the principal users of SW-15 are:

J. D. Adams
Allis-Chalmers
E. W. Bliss
Caterpillar
Chicago Bridge & Iron
Fruehauf Trailer
Graver Tank & Mfg. Co.
The Heil Company
Illinois Central Railroad
Ingersoll Rand
Iowa Iron & Steel
Kansas City Structural Steel
Link Belt Speeder
Omaha Steel
Pullman Standard Car
Santa Fe Railroad
Sheffield Steel
Trackson Company

Others are joining these every month to share the many benefits which the SW-15 electrode provides their welding operations.



SW-15 was developed as a universal type electrode which could be used for an extremely large number of welding applications. There is nothing else like it among mild steel welding electrodes!

It performed its first welding job in 1939, when it was taken into the field to weld refractory towers and sustaining structures usually welded with an E6010 electrode. It bettered the standard welding time by 50%! Its unusual ease of manipulation won over welding operators and management at once. New operators were readily trained with the SW-15. Its x-ray quality set new inspection records.

Two years later, SW-15 was welding on E6012 applications in the farm machinery and heavy road equipment fields. Excellent weld appearance, easy slag removal, little spatter, good bead with no undercut helped improve the products of these manufacturers.

Manufacturers found that due to SW-15's ease of manipulation, operators avoided slag inclusions, fish-eyes and voids, even in welds made in the field. This greatly improved the appearance of products it was used on and enhanced the reputation of the SW-15 electrode.

SW-15 is just one of the welding electrodes in the A. O. Smith line. There's an A. O. Smith electrode for every welding requirement:

MILD STEEL		HIGH TENSILE		LOW HYDROGEN		STAINLESS		STAINLESS	
AWS Class	A. O. Smith	AWS Class	A. O. Smith	AWS Class	A. O. Smith	AISI Class	A. O. Smith	AISI Class	A. O. Smith
E6010	SW-10	E7010	SW-75	E6016	SW-64	502	SW-151	310	SW-359
E6011	SW-14	E7010	SW-80	E6016	SW-65	505	SW-152	310	SW-169
E6012	SW-11	E7020	SW-76	E7016	SW-84	410	SW-153	310	SW-168
E6012	SW-17	E8013	SW-86	E8016	SW-81	430	SW-154	310	SW-368
E6013	SW-15	E9010	SW-95	E9016	SW-90	308	SW-162	316	SW-160
E6013	SW-16	E9013	SW-87	E9016	SW-89	308	SW-362	317	SW-161
E6020	SW-35	E10013	SW-88	E10016	SW-100	309	SW-166	318	SW-158
		E10020	SW-101	E12015	SW-120	309	SW-167	347	SW-157
				E12016	SW-103	310	SW-159	347	SW-357

THE ONE MILD STEEL ELECTRODE

no other can match!

...in ease of handling

SW-15 is easy for operators of varying skills to use in all positions. Its smoother arc, self-cleaning slag, lack of spatter and freedom from undercutting makes it easy for anyone to produce good looking, sound welds with the least effort!

...in quality of weldments

SW-15 welds have high-strength, high-yield, good ductility and consistent x-ray quality. This extends its use to welding low alloy, high tensile steels such as corten and manten, impossible for electrodes whose physicals can't compete with those found consistently in SW-15 welds.

...in appearance of welds

SW-15 bead appearance is excellent. Operators become more quality conscious, inclined to turn out better welding jobs when they can put in good looking welds so easily. Fine appearing welds aid in the ultimate sale of welded products, build acceptance not otherwise obtainable!

...in usefulness

SW-15 has an unparalleled history of success in many fields. Shipyards, during the war, cut their welding time as much as 50% by actual test and used millions of pounds of SW-15. Farm and construction equipment builders found its ease of application and high resistance to impact desirable, and became large users. Field erectors of vessels and structures adopted SW-15 after testing its speed, ease of application, and x-ray quality in weldments. Every year, more manufacturers turn to the SW-15 electrode to spur production and improve the quality of their welded products.

...in cutting costs

SW-15 is in a class by itself. Elimination of time-consuming slag removal, absence of spatter to be cleaned up, ease and speed of application by any operator, freedom from undercutting, excellent weld appearance that reduces inspection costs, and avoidance of weld repairs, all lower production costs directly. Then, the freedom from worry over possible field failures tops off these reasons for the tremendous use of SW-15 electrodes.

...in your plant

SW-15 has a use in your plant or shop. May we suggest that you write us or contact your local A. O. Smith Distributor for full details and a chance to test this remarkable mild steel electrode.

SMITH way

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

A. O. Smith is your best single source for

A.C. AND D.C. WELDING MACHINES

with rated outputs from 180 to 1400 amps.

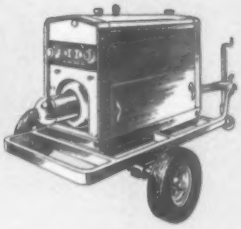
A.C. "CHAMPION"

A.C. "CHALLENGER"

A.C. "AUTOMATIC"

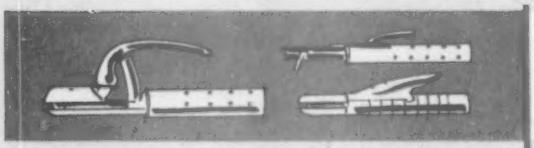
A.C. "UTILITY"

D.C. "RECTIFIER"



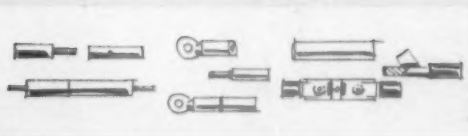
D.C. "FIELD KING"

WELDING SUPPLIES

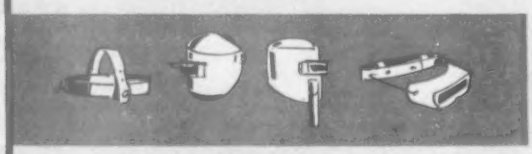


Electrode holders

Ground clamps



Cable, connectors, lugs, and splicers



Helmets, shields, headgear, and goggles

Cleaning tools, Electrode drying ovens

Protective clothing and gloves

Simplify your welding buying with

ONE PURCHASE ORDER

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION
MILWAUKEE 1, WISCONSIN

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

Here's the NEWEST ADDITION to Worthington's welding positioner line

It's the new, heavy-duty precision welding positioner with the 7 features you've always wanted in one unit

1. PRECISION GEAR AND PINION DRIVE for accurate adjustment and minimum backlash. Self-locking worm reducer provides safety factor in case of power failure. All gears are machine-cut.

2. SPECIALLY-DESIGNED VARIABLE SPEED DRIVE provides stepless speed change from zero to predetermined top speed.

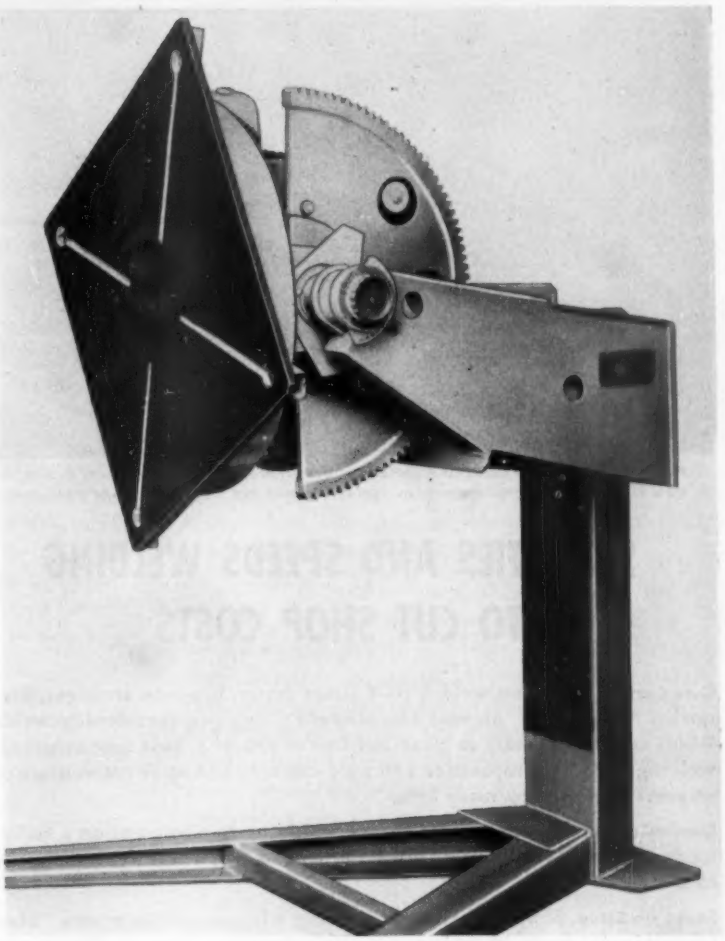
3. FAST-MOVING TILT TABLE with tilt indicator for accurate location of work at the best welding angle.

4. BUILT-IN HIGH-CAPACITY GROUND giving resistance-free return of welding current results in more uniform welds.

5. SPHERICAL SELF-ALIGNING YOKE BEARINGS eliminate misalignment.

6. HEAVY-DUTY FABRICATED STEEL POST, machined on front surface for easier raising and lowering of positioner. Positioner can be mounted on your column or wall by removing standard post.

7. MAGNETIC REVERSING STARTERS and push button controls provide for both rotation and tilt drives.



See these at the National Metal Exposition, 2111 Upper Exhibition Hall, Cleveland Public Auditorium, Cleveland, Ohio.

Y.3.4

The new Worthington positioners come in 2500, 3000, and 6000 lb. capacity sizes. Get more facts by sending the coupon to Worthington Corporation, Section Y.3.4, Plainfield, New Jersey.

WORTHINGTON

WORTHINGTON CORPORATION

Section Y.3.4 **Plainfield, New Jersey**

I'd like to know more about your new welding positioner.

☐ Please send me one of your bulletins.

☐ Have one of your sales engineers call on me.

NAME .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

Fig. 3. MANUAL LINCOLNWELD *high-current density provides all the benefits of quality, low cost "hidden-arc" automatic welding . . . yet retains ease and simplicity of hand welding as it*

SIMPLIFIES AND SPEEDS WELDING TO CUT SHOP COSTS

Cuts Costs in Half. You weld 3 to 4 times faster, produce stronger, higher quality welds with "Manual Lincolnweld's" high-current-density welding. Welds are smooth, easy to clean and free of porosity. Less time required for welding, for joint preparation and weld cleaning add up to cut welding costs an average of 50% on many jobs.

Eliminates Joint Preparation. By concentrating up to 600 amps on a 5/64" electrode, "Manual Lincolnweld" gives 100% penetration butt welds on plates up to 3/4" thick.

Saves on Setup. Simpler than hand welding with coated electrodes, "Manual Lincolnweld" feeds its continuous wire electrode automatically. Granular flux from the cone reservoir of the welding gun keeps the arc submerged . . . prevents arc rays, minimizes smoke to make welding easier. The welding gun can be operated manually or mounted in simple fixtures to provide the benefits of automatic welding with the flexibility of manual welding.

Simple to Operate. "Manual Lincolnweld" is compact, portable . . . moves about the shop on wheels. It operates from a Lincoln "Shield-Arc" 600 amp DC welder.

START CUTTING COSTS TODAY. "Manual Lincolnweld" procedures and speeds are presented in Bulletin 1303. Write on your letterhead to Dept. 1710.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

MANUAL LINCOLNWELD CUTS WELDING TIME 50%

"Hidden-Arc" welding using "Manual Lincolnweld" is cutting welding time 50% and more on many components for Gar Wood earth movers. On some jobs, overall welding time has been reduced as much as 67% because of less warpage, lower set-up time and greater freedom from weld spatter.

Strength and quality of welds produced with "Manual Lincolnweld" are equal to fully automatic welding. Setup time, however, is less since the work can be welded in the tacking position, and the welding gun of "Manual Lincolnweld" can be used in any flat or near-flat position.

In the fabrication of these Gar Wood side frames, two men produce one pair of frames in only 8 hours. Each frame calls for 174 feet of welding. With hand welding, 40 manhours were formerly required to do this work.

Duplicate benches are used for fabricating the right and left side frames. Two men working as a team set up, tack, and weld, using the "Manual Lincolnweld" for both "hidden-arc" and open arc welds.

Fig. 1. Welding Manhours 60% Less *on side frame for earth mover assembly. With "Manual Lincolnweld", sides are finished in 16 manhours . . . formerly took 40 manhours, a 60% saving in time. Each side requires 174 feet of welding.*

Fig. 2. Simpler to Set Up. *Components for side frame are tacked in position and welded with "Manual Lincolnweld". Joints too steep for "hidden-arc" welding are welded with coated electrodes.*

ESTABLISHED 1916

THE WELDING ENGINEER

OCTOBER, 1953

Another Black Eye

A PILE of fire-blackened junk four blocks long and two blocks wide is all that is left of the General Motors transmission and instrument plant in the Detroit suburb of Livonia. Property damage is estimated at $35,000,000 to $50,000,000. Three General Motors employees and a fireman lost their lives. Production of Cadillacs, Oldsmobiles and Pontiacs was drastically curtailed. An estimated 45,000 workers were thrown out of jobs.

And all because of a few people's carelessness.

It started on the afternoon of August 12. Welding was being done with torches, in the presence of a foreman, above a conveyor carrying transmission parts in a cleaning bath of oil. Sparks from a torch were allowed to drop into this oil bath.

In its early stages, the fire was confined to the oil pan beneath the conveyor. Plant employees were prompt with chemical fire extinguishers and had the blaze almost under control when some person as yet unidentified brought up a fire hose. The high-pressure water pushed the burning oil back into its storage tank, which exploded and scattered the fire all over the plant. It was then too late to save anything.

Here we have one of the newest, most modern plants in the world turned completely into rubble in the short period of three hours. Who or what got the blame? According to the reporters, it was welding.

"The fire is believed to have been started . . . by the spark from a welding iron," declared one newspaper. Said another: "A spark from a welding torch set off oil, which spread the flames."

We could quote from even more news items, but what's the use? All over the country, welding was given the dubious honor of causing "one of the largest fire losses ever experienced in a single plant."

IN February of this year, I wrote an editorial entitled "A Black Eye for Welding." Here is another black eye, and brother what a shiner! Yet this fire would not have occurred if the few simple safety rules that I included in my February editorial had been heeded. These rules (courtesy of the International Acetylene Association) are:

1. Never use cutting or welding torches where sparks or an open flame would be a hazard.

2. Before you cut or weld in a new location, check with the nearest foreman or superintendent to see if he knows of a fire hazard that you might fail to guard against.

3. If cutting is to be done, materials that burn easily should be at least 30 ft from the torch.

4. Use sheet-metal guards, asbestos paper, asbestos curtains or something fireproof to keep sparks close to the work. Do not use tarpaulins!

5. Sweep floors clean before you light the torch. Wet down wooden floors.

6. See that the hoses for oxygen and acetylene are guarded against possible injury.

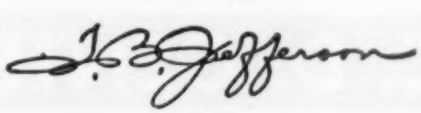
7. Do not weld or cut on tanks that have held gasoline or other flammable liquid without taking special precautions. If you do not know what precautions to take, ask the International Acetylene Association, 30 East 42nd St., New York 17, N. Y.

8. Be ready to put out any fire promptly. Fire extinguishers, water hose or pails of water and sand should be ready for instant service.

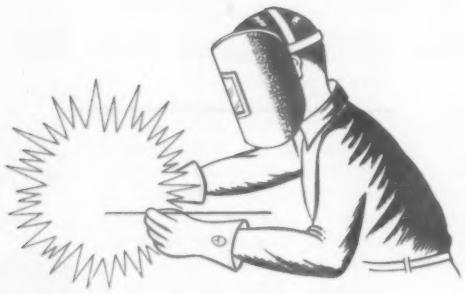
OBVIOUSLY, Rule No. 1 was disregarded. Probably Rule 4 was also neglected, or the sparks that started the blaze would not have been allowed to escape. In addition, a fundamental rule of fire-extinguishing was violated: never turn water upon an oil fire. The violation of this rule, which restarted the fire after it had been brought under control, had nothing at all to do with welding. Yet welding got all the blame!

Elsewhere in this issue, there will be found a special section with four articles on various aspects of safety in welding. We did not plan a fifth article to discuss fire hazards because we thought that everybody knew all about them. Apparently, there are people in our industry who do not.

When all the safety rules are observed, the chance is small that any disastrous fire will be started by gas welding, flame-cutting or arc welding. Maybe a good start toward fire prevention in your own plant would be to furnish each of your employees with a copy of the eight simple rules that we have again reprinted on this page. And insist they be learned for Fire Prevention Week, October 4-10.



DON'T
Take Chances!
Use the Best . . .



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Genco Welding Gloves have the following outstanding features:

TOUGH, SOFT LEATHER — Perfect Fit.

LARGE or JUMBO PATTERN—Cooler Hands, Quick Removal.

WOOL LINING — Absorbs Perspiration, No Balling or Pulling Loose.

CONSTRUCTION—Extra Reinforcing, Strength Where Strength Is Needed.

Genco makes Welder's Gloves for Welders. They can be made to your specifications with extra reinforcing—extra patches—thumb strap—pull tab—double thumb—wing thumb—straight thumb—multiple piece or one piece back. You may select the leather desired, such as Cowhide for durability; Horsehide for flexibility and feel; Carpancha for softness. Special gloves are available for various types of welding jobs—Heavy Duty—Maintenance—General Shop—Pipe Welding—Shipyard—Burning.

Genco also manufactures:

SLEEVES, APRONS, ASBESTOS MITTENS and PROTECTIVE CLOTHING OF ALL TYPES. Write for FREE catalogue.

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HOTEL Cleveland, next to Union Station, is the AWS meeting place

PUBLIC AUDITORIUM, not too far away, is the site of the 35th Metal Show

Cleveland: October 19-23

Cleveland meetings are always good ones. You can look forward to a lot of fun and to the securing of much useful information at the coming AWS convention.

BY CLYDE B. CLASON

AFTER a lapse of four years, the American Welding Society returns to Cleveland for its national fall meeting. The Society's 34th annual convention is scheduled for the convenient Hotel Cleveland (same as in 1949), Monday morning October 19 through Friday October 23.

Like last year's convention, the program promises to be moderate in the number of scheduled events. There are, for instance, only 19 technical sessions, at which a total of 62 papers will be presented. We can remember one AWS meeting a few years ago when 87 technical papers were presented in 24 sessions. The programmers seem to have learned.

Adams Lecture

As in last year's convention at Philadelphia, the program will begin with the prize awards, followed by the Adams Lecture, on Monday morning. There will be no competing technical sessions during that period. The Adams Lecture is to be given by R. B. Shepheard, of the Shipbuilding Conference, on aspects of welding research in British merchant shipbuilding.

Rex Beaumont Shepheard is director of the Shipbuilding Conference, London. A graduate of Glasgow University in naval architecture, he joined Lloyd's Register of Shipping as a ship surveyor in 1928 and was appointed chief ship surveyor in 1944, relinquishing this position in September 1952 to take up his present duties. He is a member of Council of the Institution of Naval Architects, member of Council of The British Shipbuilding Research Ass'n and of the British Welding Research Ass'n, and member and chairman of the Sub-Committee of the Admiralty Ship Welding Committee, also a commander of the Order of the British Empire.

The social side of the convention will be represented by the customary president's reception and the annual dinner. The president's reception will be held Monday evening and the annual dinner Thursday evening.

Bring a Birth Certificate

Two plant visits are planned: one to the Cleveland tank plant of Cadillac Motor Car Division, GMC, and the other to the Euclid Road Machinery Co. The visit to the tank plant requires proof of American citizenship so bring along a birth certificate if you want to attend this one. Also the number of visitors is limited to 75, and it's first come first served.

Other special events are the national officers' dinner on Monday evening, the section officers' dinner on Wednesday evening, the WRC university dinner and conference (also on Wednesday evening) and the board of directors' meeting and annual business meeting on Thursday afternoon.

Plummer Re-elected

Fred L. Plummer, who so capably directed the affairs of the American Welding Society during the 1952-1953 term, will continue as president for another term. Mr. Plummer is director of engineering of the Hammond Iron Works, Warren, Pa.

J. H. Humberstone, vice-president, Air Reduction Co., Inc., New York City, moves up from second vice-president to first vice-president, taking an office left vacant since the death of Eric R. Seabloom last February. Mr. Seabloom would have been president this year had he lived.

John J. Chyle, director of welding research, A. O. Smith Corp., Milwaukee, has been elected second vice-president for the 1953-1954 term. R. S. Donald, of R. S. Donald, Inc., New York City, has been re-elected treasurer.

The AWS board of directors will be enriched next season by four new directors-at-large. These are: Ray L. Townsend, owner, Tweco Products Co., Wichita, Kan.; Hal Savage, pres-

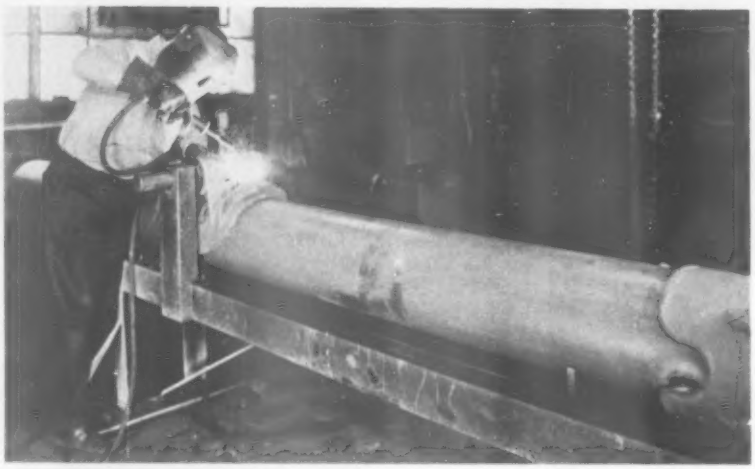
(Continued on page 76)

SAFETY

It's Easy to Be

SAFETY in arc welding is really a twofold matter of: (1) educating the weldor and (2) protecting him from injury. He may be injured by electrical shock, radiation or by failure to provide adequate ventilation. The subject of ventilation is discussed in another article of this safety series, as is the protection from visible and invisible radiation. Hence our primary concern here will be the avoidance of electrical shock.

One cause of shock is carelessness in setting up the work so that the operator can become a part of the circuit. This can happen while he is changing electrodes, setting up work or changing work positions. The danger will disappear, however, if he is properly instructed and uses the equipment provided for his protection.



POSITIONING of the work in a jig or fixture will make for a safer arc-welding operation. Frame or case of the welder should always be grounded

The voltage that exists between the electrode holder and the ground during the off-arc or no-load period is known as the open-circuit voltage of the welder. The open-circuit voltages required for welding are low compared with the voltage used on lighting circuits or on many portable electric tools and normally would not cause injury or severe shock. The weldor's knowledge of this fact may tend to make him careless that any danger exists. There is danger, however, and particularly in hot weather when the weldor is sweaty or wet. He should take care to see that he is always insulated from both the work and from the electrode-and-holder side of the circuit. He should not permit the bare metal part of the electrode or any metal part of the electrode holder to touch his bare skin or any wet clothing on his body. The use of well-insulated electrode holders, insulated cables and dry welding gloves will be helpful in avoiding such contacts.

Welding Machines

Both a-c and d-c welders are subjected to extremely hard usage indoors and receive little, if any, added protection outdoors. Consequently, their construction must be rugged. At the same time, many requirements call for a portable machine, which means a welder that is not only rugged but relatively light in weight.

Over a number of years, standards for electric arc welding machines have been developed and kept up to date by the National Electrical Manufacturers' Association. These NEMA standards cover established practices in rating, basis of rating, methods of test and broad overall principles of construction contributing to safety.

There are three basic classifications of arc welders: 60% duty-cycle, 50% duty-cycle and the limited-input welder. These classifications apply to both a-c and d-c welders.

It is not necessarily true that the only safe welder is one approved by Underwriters Laboratories, Inc. For example, d-c welders in the 60% duty-cycle class, rated at 200 amp or more, are never subjected to UL approval. These heavy-duty, industrial-type arc welders are built to NEMA standards and usually go into industries where personnel is available to supervise installation and operation. Consequently, they don't encounter conditions that might prevail for machines used in the field or in the small shop.

The 50% duty-cycle rating applies to welding machines of 200 amp or less intended for light welding operations under conditions that do not require more than 50% continuous welding service. The limited-input welder is for use in single-phase circuits of limited capacity. These welders were designed primarily to meet REA standards of power load and have proved extremely popular as farm welders. They are made in two sizes: 130 and 180 amp. Besides farms, they are found in garages and small shops.

The 50% duty-cycle welder and the limited-input welder are both portable machines, not generally used in a fixed location. Standard practice is to provide these types of welders with a primary service cable and fittings and also a complete set of welding accessories. These welders are usually listed by Underwriters Laboratory, Inc., because they are generally used in locations and in shops where expert supervision is not available.

Installing Welders

One of the easiest places to run afoul of welding safety is in the installation of welders. A point often overlooked is that the frame (case) of the welder should be ground. Grounding should be done with both a-c and d-c machines in order to protect the weldor. If it is not done, the weldor may be ex-

Safe While Arc Welding

ON JOBS like this, other workers must be protected from flash

posed to the power-supply voltage in case of a breakdown of insulation in the machine. Although an insulation breakdown is improbable in modern welders, grounding of the frame is a safety measure that should always be observed.

It is easy to ground a frame or case in a permanent installation. On portable welders, however, such grounding can easily be overlooked. The use of multi-conductor primary cable is recommended on small, portable single-phase a-c welders, such as might be found in hobby shops, in homes or on the farm. UL-approved primary cable has two power conductors and one ground conductor. The fittings for these connections are usually supplied with the welder.

Multiple Welders

Normally, the open-circuit voltage of a welder is well within the range of safety. There are welders today operating on an open-circuit voltage as low as 30 volts. In other welders, the open-circuit voltage is up to 65 volts or, in some instances, up to the 80-volt maximum permitted by the NEMA standards. Even though the open-circuit voltage of the individual welder is low, when more than one welder is connected into the line without attention to polarity and phase relations of the individual welders, a dangerously high voltage may result. Admittedly, this is a remote possibility, but it should always be considered when one is hooking up two or more machines.

For example, suppose that two d-c welders are being linked, and that one welder is set for straight polarity while the other is set for reverse polarity. The open-circuit voltage in this case would be the sum of the open-circuit voltages of the individual machines. This means that a man coming into contact accidentally with uninsulated parts of electrode terminal, cables or holders would be subjected to the individual voltages of both machines. If the machines were working on the maximum open-circuit voltage of 80 volts, the unlucky weldor would receive a jolt of 160 volts. That could be dangerous.

A-c welders that are not properly phased may set up similar freak conditions to expose the weldor to unnecessarily high voltages. Be sure and check these points when the welders are installed.

Welding Cables

The welding circuit includes the electrode and ground leads (welding cables), electrode holder, ground clamp and sometimes connectors for extending the leads. The weldor is always near to some part of the welding circuit. Any part of it that is defective may cause harm to him.

Welding cables are continually subjected to hard usage and abuse. They must be highly flexible and are usually operated at their maximum capacity. Hence they are likely to be abused as much through their electrical load as by wear and tear in service. For both reasons, cables should be examined regularly. A cable with broken insulation is a hazard to workers.

Should a cable develop a break in insulation or in stranding, the best thing to do is to cut out the defective section and splice the two ends together with a cable connector. The spliced area should be properly insulated, naturally.

The location of the ground clamp is extremely important. Be sure that it is not connected in such a way as to promote a fire hazard. Pipes carrying gases, flammable liquids or other electrical conductors should never be used as ground returns.

Where it becomes necessary to connect a ground to a pipe on a structure that might have joints in it, check all the joints to be sure there is no sparking or heating that could create a fire hazard. If a pipe on a steel structure with joints is to be used as permanent ground, each joint should be bonded, just as rail joints are bonded.

Electrode Holders

Fortunately, very few bare-jaw holders are still in use today. The fully insulated holder was originally developed to provide protection against accidentally leaving or moving the bare holder in contact with the work. Weldors quickly showed a preference for it, and today this type is the most common.

It is generally recommended that insulated holders be used with a-c welders. In addition to safety protection, it has been found that the insulated holder lasts longer because its parts are insulated from the heat of the electrode and weld spatter. Thus there are many reasons and advantages for using this safe tool. Care should be taken, however, that a fully insulated holder does not have exposed screw heads or other portions that might come into contact with the operator.

There are three rules that a weldor should follow on every job:

(1) Make sure that the electrode connection and the insulation on the holders and cables are good.

(2) Remove partially used electrodes from the holder when it is not in use.

(3) When the holder is not in use, lay it down or hang it up so that it will not contact other persons or electrical-conducting objects.

Arc welding is as safe as any other occupation—until you get careless.

Table I. Shades for Welding Lenses

Application	Shade No.
Light welding or lead welding	4
Spot welding, minimum	5
Flame-cutting, minimum	5
Gas welding	5
Gas welding	6
Gas cutting	6
Arc welding to 30 amp.	6
Heavy gas welding	8
Arc welding and cutting to 75 amp.	8
Arc welding and cutting 75 to 200 amp.	10
Arc welding and cutting 200 to 400 amp.	12
Arc welding and cutting over 400 amp.	14

Courtesy Linde Air Products Co.

SCARFING flame produces radiation (infrared, visible, ultraviolet) from which the eyes must be guarded

You Have Only One Pair of

WELDORS are subject to two types of eye injuries—from foreign bodies in the eye and from "weldor's flash." Non-weldors know all about foreign bodies in the eye, but weldor's flash is confined to those working at and around welding. While the results are not serious, the experience can be painful.

When one is working near the brilliant flame or the even more brilliant arc, there are three types of radiation against which it is necessary to safeguard the eyes. Two of these are invisible: ultraviolet and infrared radiation. The third type of harmful radiation is simply visible light brought to a high intensity.

Ultraviolet Radiation

When the presence of ultraviolet rays is known, it is very easy to guard against them. Very few materials will transmit both ultraviolet and visible light, and the materials that possess this property are not in common use. Moderately thick clear glass, sheets of clear or amber mica, green celluloid or gelatin are all opaque to ultraviolet.

Caution: Ultraviolet rays are capable of being reflected the same as visible light rays. Consequently, they may easily be deflected behind the lens of a spectacle and so injure the eye. For this reason, it is not sufficient to guard the eye with ordinary spectacles when you are working near a source such as the iron arc known to be rich in ultraviolet rays. Goggles that fit closely around the eyes or a welding helmet are the only sure protection. If you use a hand shield, it should be held close against the face, not several inches away, for the same reason.

If your eyes are not adequately protected from the extremely short-wave ultraviolet rays, the crystalline lenses of the eyes will absorb these rays. This absorption has a tendency to cause the affected eyes to shine in the dark like the eyes of a cat, which may disturb vision. Ultraviolet rays may also produce an injury similar to sunburn. Either condition is sufficiently serious to justify the wearing of an ultraviolet absorption lens.

Infrared Radiation

Infrared rays are long-wave rays at the opposite end of the spectrum from the ultraviolet. They are frequently termed heat rays because they are absorbed and changed into heat when they encounter a material which they cannot penetrate. The effect of these rays on the unprotected eyes may be serious: much like a sunburn within the eye. It is therefore very necessary to guard the eyes from them.

While ordinary colored lenses will absorb infrared rays to a certain extent, they do not afford sufficient protection against any intense source such as a welding flame or welding arc. Fortunately, there are several kinds of glasses which although fairly transparent to visible light have a wonderful power of absorbing heat rays.

Visible Radiation

To complicate the eye-protection problem still further, we have also to protect against the effects of visible radiation. This means a lens that provides clear vision without glare.

The normal eye has considerable trouble in distinguishing colors at the extreme violet and red ends of the spectrum. This difficulty is completely corrected within the middle range of colors: green, yellow and orange. It follows, therefore, that a much clearer definition of an object will be obtained by a combination of yellow and green light than by red light

Courtesy S. Morgan Smith Co.

WATCH OUT for reflected rays when welding in confined quarters

Courtesy Linde Air Products Co.

CHIPPING goggles are needed by the men who do weld-cleaning jobs

Courtesy American Welding & Mfg. Co.

FLASH welding produces both intense light and flying particles

Eyes—Take Care of Them

alone or, especially, by blue or violet light alone. The eye is also more sensitive to yellow and green rays. This can easily be checked by looking at a sunlit landscape or fleecy clouds in the blue sky through glass plates of different colors. A glass of a light amber color or amber lightly colored with green will bring out details that you can scarcely see without the glass and which are obscured completely by a blue or violet glass.

The selection of a color hue for a welding lens should be designed by an expert in order to obtain the clearest definition of vision with the least amount of glare. The depth of the tint, however, is best determined by the weldor himself. Owing to differences in vision, one man can see clearly through a glass that is too dark for another.

So that we may be sure that the welding lenses we use are suitable, the National Bureau of Standards has set up different specifications (Table I). American lens manufacturers observe these carefully established standards; nevertheless, lenses are sometimes defective and should be carefully examined for such defects as pinholes or bubbles, which might permit the passage of high-intensity light. Even tiny defects will cause the wearer's eyes to stray unintentionally to the light source and thus result in eventual eye discomfort.

Some lenses, especially imported ones, have been found to have absorption of different bands in the orange-yellow portion of the spectrum. Watch this. Another common fault of inexpensive or imported lenses is the transmission of ultraviolet and infrared radiation.

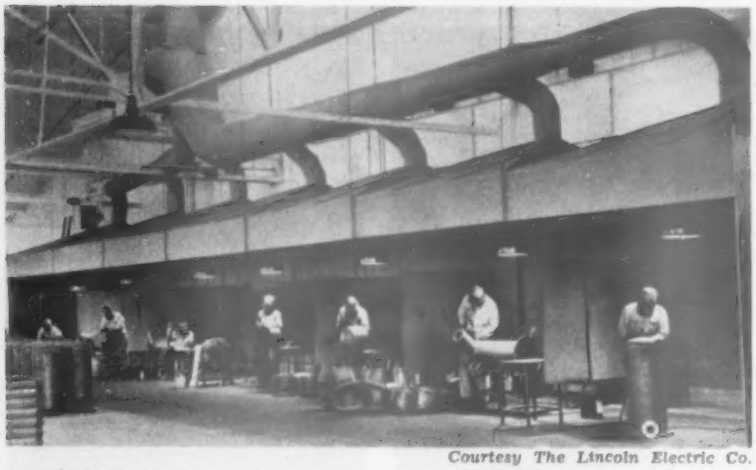
Care should also be taken to see that both lenses of the welding goggles are of the same shape. One cannot be too careful in lens selection and examination.

Mig and Tig Welding

While the problems of eye protection for inert-gas welding are the same as those for metal-arc welding, it has been found that in some instances the ultraviolet radiation is more intense. There is a tendency, moreover, for weldors working at Mig or Tig welding to dispense with the clear glass cover plate over their protective lens since spatter is not a problem in this welding application. If eye irritation persists when a cover glass and welding lens are both used, try inserting another cover glass behind the welding protective lens, thus making a sandwich with the welding lens between two cover glasses. Usually this will be enough.

Resistance-welding operators do not need to shield themselves from intense infrared, visible and ultraviolet radiation. They are subject, however, to the likelihood of getting foreign bodies in the eyes, which may present as great, or greater, a hazard than radiation. For this reason, it is essential that resistance-welding operators wear safety shields or welding goggles. The same precaution is even more important for those engaged in chipping or cleaning off slag from gas and arc welds.

Despite the many hazards apparently at hand to damage the weldor's eyesight, little actual harm is done. Medical authorities have investigated the effects of welding upon the eye and have been unable to find any indications of visual deterioration or other eye damage as a result of working as a weldor. Periodic eye examinations made by many companies have tended to substantiate this fact. By developing adequate protective lenses, modern science has removed whatever danger might be inherent in this occupation.

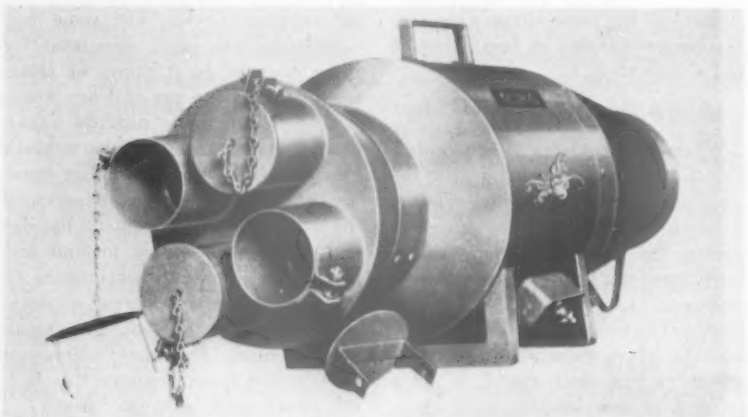


Courtesy The Lincoln Electric Co.

1—LARGE central ventilating system solved the problem once and for all

Courtesy Mine Safety Appliance Co.

2, 3—BEFORE and after fume removal with a 25-lb portable exhauster



Courtesy Chelsea Fan & Blower Co.

4—JUNIOR "octopus" is portable and will handle up to four hoses. Senior model (not shown) is stationary, and up to six hoses can be connected

Fumes No

UNDER proper conditions of ventilation, the fumes that result from the welding of iron and steel are not harmful to the weldor. Medical science has thoroughly investigated the effects of such fumes and given them a clean bill of health.* Zinc fumes may cause an illness of a day or so if the weldor inhales them; such fumes are produced during the welding of galvanized steel, brass or other zinc-bearing alloys. Some common brazing alloys that are called "bronze" are actually brass and can produce the fumes that result in the "zinc chills" or "metal fume fever."

The fumes from lead and cadmium are both poisonous. These two metals should never be welded nor flame-cut unless the operator is given the protection of an air-line respirator or air-supplied helmet. Neither lead nor cadmium will be met with often, however, in the average welding shop.

How Many Cfm?

What constitutes "proper" ventilation? The writer put this question to leading manufacturers of equipment and was told by one and all that no general recommendations can be given as to the number of cubic feet of air that should be handled per hour or per minute. Conditions vary to such a high degree in the different welding shops that each case has to be considered on an individual basis. Some medical authorities have recommended at least 200 cfm per weldor, with the exhaust hood within 8 in. of the work.

The fume-removal problem may necessitate an elaborate central system of ventilation like the one designed for the welding booths of Erie Meter Systems, Inc., Erie, Pa. (photo 1). At the opposite end of the size scale is the portable fume exhauster. Photos 2 and 3 depict a "before and after" situation in which heavy welding fumes were satisfactorily cleared with a 25-lb exhauster.

The exhauster used to do this job

*See "Welding and Cutting Fumes," The Welding Engineer, October and November, 1949.

Problem with Right Equipment

Courtesy Mine Safety Appliances Co.

5—AIDED by compressed air or steam pressure, the above striped cone can move a large volume in a hurry

Courtesy Ruemelin Mfg. Co.

6—FUME collector picks up at source. Inlet hood can be brought down very close to the point of welding

measures 34 in. in length by 10 in. in diameter and is furnished with a 1½-in. flexible metal hose 12 in. long. In service, the intake end of the hose is placed approximately 4 in. from the welding arc. If necesary, the hose can be held in one hand while the weldor works with the other.

Another type of welding fume exhauster is offered in both stationary and portable (photo 4) models. These units are called "octopuses" because of their construction. The Senior (stationary) and Junior (portable) models both have several adapters on their ends to which flexible hoses are connected. Either model can be converted from sucking to blowing by changing the position of the nozzle adapters. Caps close all the nozzles that are not in actual use.

Capacity of these ventilators varies with the nozzle diameter and with the length of hose. With a 10-in. nozzle and one 100-ft hose, the Senior model can move 3,000 cfm of air. With 3-in. nozzles and six 100-ft hoses, it can move 156 cfm through each hose. With six 10-ft hoses, 330 cfm is moved through each hose. The Junior model with 50-ft hoses can move 1,020 cfm through one hose with an 8-in. nozzle or 155 cfm through four hoses with 3-in. nozzles. With 10-ft hoses, these figures become 1,350 and 275 cfm respectively.

A Big Striped Horn

For the rapid movement of large volumes of air, another type of ventilating device operates on a different principle. It looks like a big striped horn (photo 5). This ventilating cone converts the pressure of either compressed air or steam into a large volume of moving air. The 3-in. diameter model is said to be able to move as high as 800 cfm with 90-psi line pressure; the 6-in. model up to 3,150 cfm at 70-psi line pressure, and the 10-in. model 5,160 cfm at 80-psi pressure.

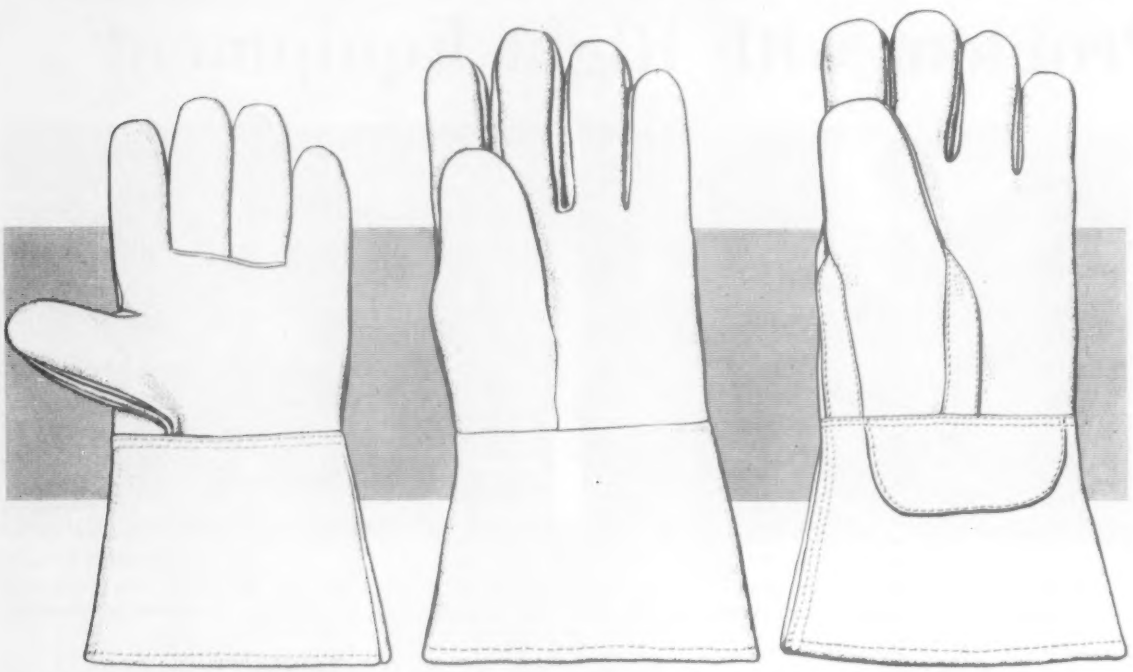
The compressed air or steam is fed through a side outlet at the bell end and expanded at high velocity through a ringlike orifice. This produces a powerful venturi effect. The atmosphere to be moved is drawn through the bell and delivered through the outlet horn along with the expanded steam or air.

Pick-up at Source

Another piece of equipment, successfully used in many installations, is a welding fume collector (photo 6). This operates on the principle of picking up the welding fumes at the source. The inlet hood can be brought down very close to the point of welding, catching the fumes before they have had a chance to rise and spread throughout the shop atmosphere. This method requires but a small volume of ventilating air for each hood and hence reduces fan power consumption to a minimum. It is possible to use multiple fume collectors that are operated from a single exhaust fan.

The same manufacturer also offers a steel welding cabinet that is supplied with controlled ventilation including a fan with a 1/3-hp motor. The cabinet measures 28 in. deep, 36 in. wide and 70 in. high. A rotating positioner can be included with it if the purchaser wishes. This cabinet is said to be very practical in production work where small parts are welded or for use in welding schools.

To sum it all up, if you have any reason to believe that your present method of ventilation is inadequate, we suggest that you get in touch with a manufacturer's engineer and learn what one of these newer methods can do for you. Ventilation is particularly important if you are doing any large amount of welding on galvanized sheet metal or on brass or if you are braze welding with a zinc-bearing filler alloy.



1—GUNN-cut gloves do not require so much leather because the middle two fingers are sewed in

2—CLUTE-cut gloves use a single piece of leather for the palm and fingers. This thumb is inset

3—GLOVE designed for hard and tough service. It is Clute-cut and has a reinforced inset thumb

Which Pair of Welding

An average pair of welding gloves has a life of only two weeks. Any plant can save a considerable sum annually if it learns how to make gloves last longer.

AN AVERAGE weldor in a fabricating shop uses 26 pairs of gloves a year. This means that the average life of a pair of gloves is less than two weeks. This is the average life. Since some weldors' gloves are known to last for several months, there must be others that last for only a few days. And weldors' gloves are priced from $1.50 up to $5 per pair! This one item can easily run into real money if you don't watch out.

Why don't welding gloves last longer? They used to in the old days when the weldor was compelled to buy his own protective equipment. Then he would pay no more than he had to for a pair of gloves, but he would usually look after them. Now working contracts require the employer to provide safety equipment for employees, including gloves for the weldors. How the picture has changed! A weldor who is not too happy with the gloves issued to him will often deliberately tear or damage them in order to get a new pair.

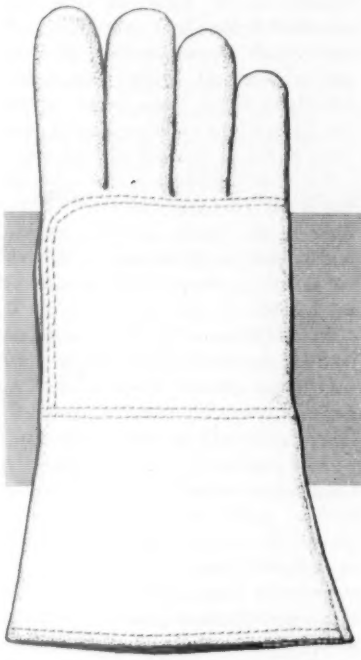
On the other hand, a weldor who is convinced that his gloves are of good quality and comfortable from a working standpoint will want to make them last as long as possible. He feels that he will have difficulty in getting another pair just as good so he is anxious to hang onto these gloves as long as he can. Hence the gloves that weldors like will experience only normal wear and will not be subjected to carelessness and deliberate vandalism.

Gloves that last only two weeks will prove to be rather expensive, no matter how little the initial cost. And some welding gloves may last only a few days! Obviously, it's better to pay more and make sure that only gloves of the best quality are purchased.

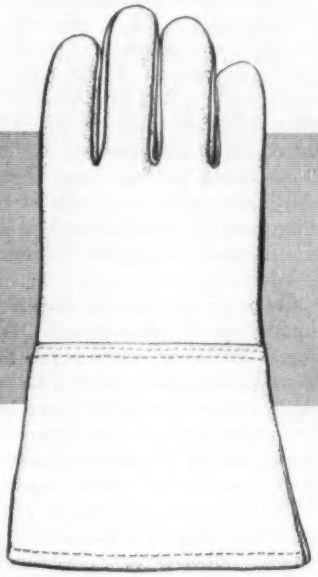
What Is Glove Quality?

The big question, of course, is how do you determine the quality of a glove. Many factors are involved. The materials of which the glove is made must be carefully considered. Equally important is the way in which the separate pieces are joined together. Finally, there is the problem of application to the particular job. What is satisfactory for one type of welding may not serve at all for a different type of work.

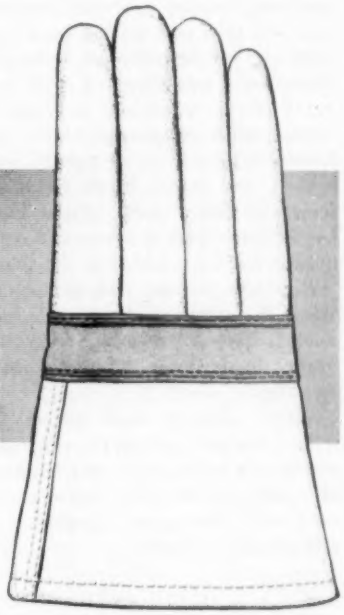
In a shop where a lot of mainte-



4—BACK patch provides an extra protection to the weldor. A glove especially good for overhead work



5—ONE-PIECE back is the most common construction for weldor's gloves. Compare with Fig. 6



6—MANY pieces of leather are sometimes sewed together to make up the glove back. Compare with 5

Gloves Will Save You Money?

nance weldors are doing general work, including fit-up and the handling of steel, a Clute-cut glove of buff horsehide is usually preferred. The term "Clute-cut" will be explained later on. This type of glove is flexible, gives a lot of feel and enables the weldor to handle other tools than those used for welding.

Pipe weldors also want a lot of feel in their gloves. Moreover, their gloves must also be suitable for tough service. Hence the gloves that pipe weldors select are similar to those used for maintenance welding.

On production work where lots of heavy welding of a high duty cycle is the order of a working day, the preferred glove is of heavy cowhide with patches on the back for extra protection and a double lining. Such gloves generally require other reinforcements such as patches and double leather on the thumbs. This same heavy glove will be preferred on piecework welding, particularly where the weldor or his helper has to put the weldments into a jig and take them out over and over again during the course of a working day. This handling of weldments means that the glove must have extra heat protection in the palm and must also be able to withstand the abrasive action encountered. Ventilation and roominess are other features that will be demanded of gloves in this type of service. A closely fitting glove will become very warm inside and cause the wearer's hand to sweat.

In the small shop, or for the man who still buys his own gloves, no particular style or type of glove can be recommended as the best since every individual will have his own ideas as to what he wants. In these shops you will see a variety of gloves—Clute or Gunn cut, lined and unlined, depending on the purchaser's fancy and purse.

Glove Construction

Regardless of the type of glove, its construction should be carefully examined. Gloves made by reputable manufacturers will have good fitting of parts and sewing of good quality. This can only be insured by a quality control program during manufacture. Rigid inspection is essential since welding gloves are usually produced on a piecework basis.

In checking over glove construction, you will find that the cheaper

Memo to Glove Buyers

Cheap gloves are characterized by lack of size.

There is an absence of welting and reinforcement.

They may be made of soft belly leathers that tear out at the seams.

gloves are characterized by their lack of size. There is less leather per glove, and such features as special reinforcing, pull tabs and welting have been omitted. The omission of welting is particularly significant. A welt is a small cord sewed on a seam to strengthen it or an edge of the material folded on itself, usually over a cord, and sewed down. When the fingers or other parts of the glove have been welted, it means that extra quality has been added to the gloves for greater service and protection. When the nature of the work is such as to require extra reinforcing, the buyer should insist on such details as welts.

When a glove tears out in the seams, the user feels that poor workmanship is to blame. It may be, however, because soft belly leathers were used rather than good, top-grade side and shoulder leathers.

Gunn and Clute Cuts

The cheapest glove is usually a Gunn-cut glove, as pictured in Fig. 1. In a Gunn-cut glove, the two middle fingers are sewed into the glove. This tends to make an uncomfortable seam in the palm of the hand. However, it is the cheapest type of glove to make since it does not require the larger pieces of leather. A Gunn-cut glove may be custom-made of quality leather, have welted seams, a one-piece back and be half lined, and still be inexpensive. It is the type usually purchased when price alone is the determining factor.

The more expensive gloves are Clute cut (Fig. 2). A Clute-cut glove has a one-piece palm, but the back can be either single-piece or made of a number of pieces. This style glove is not only the most comfortable, but it can also be reinforced (Fig. 3) much easier and more satisfactorily than the Gunn-cut glove.

These two basic glove styles may be varied in several manners. Either style may have a winged thumb (Fig. 1) or an inset thumb (Fig. 2), and may be lined or unlined. If the glove is lined, there may be either a half lining or a full lining.

When it comes to reinforcing, the length of life of the glove may be increased by pull tabs, back patches (Fig. 4), double thumbs, thumb straps, special patches, right thumb and finger patches and soft or stiff cuffs. Watch for such details.

Quality gloves are cut large. They are easy to put on or take off, and the extra size allows for heat shrinkage of the leather. If the pattern is large, there is less likelihood of ripping the glove when the fingers are thrust into it and also less likelihood of a lining pulling loose. Smaller gloves are subject to both of these disadvantages and also cause the weldor's hands to sweat and feel uncomfortable.

Check to see that the fingers and thumbs are of sufficient length. When finger and thumb space is too short, fingers and thumb will soon be pushing out at the end of the glove. Also, the angle between the finger and thumb should fit snugly against the hand, insuring full finger movement.

The wrist and cuff should also be large and loose. Looseness will provide for air circulation, while flexibility at the wrist will give ease of motion. It is quite essential that the cuff be long enough to provide proper protection against flying sparks and spatter.

Glove Leathers

As for the leather that goes into the glove, the standard leathers are cowhide, horsehide and pigskin. Chrome-tanned cowhide and horsehide are probably the most common. These leathers are available in a natural pearl gray or are dyed in different shades of brown. Cowhide is the most desirable and will outlast any of the other glove leathers when it comes to withstanding abuse from burning, weld spatter, abrasion and cutting. The biggest objection to cowhide is that it is stiffer than other leathers when new. It does soften, however, when broken in. Usually, a cowhide weighing from 2¾ to 3½ oz per square ft is selected for glove manufacture. A cowhide glove of this weight will not be too stiff.

Horsehide leathers include both chrome-tanned and buff horsehide. The latter is usually dyed red or dark brown for operator eye appeal. Pigskin is a natural yellow in color. This type of glove, however, is not too common.

All horsehide or cowhide leathers should be of top-grade side and shoulder leather and preferably winter leather. Horsehide is soft, which generally appeals to the weldor. Buff horsehide, which has a smooth finish, has tremendous operator appeal when dyed to the proper color. It also provides good flexibility and wears well, but it has a tendency to pull if sewed tight in the seams. For this reason, buff horsehide should always be welted as looser sewing will be covered by the welt.

In addition to the three standard leathers, special leathers are also used in making gloves. Their availability depends upon the demand created by other products. For instance, the most widely used of the special leathers is Carpancha, which is the backside of leather used in women's pigskin gloves. If women's pigskin gloves are in fashion, there is usually a good quantity of Carpancha available. Other special leathers used in welding gloves from time to time include wild pig, goat, deer, antelope and other varieties of domestic and imported leathers. Such special leathers are usually extremely soft and not too durable for rough usage.

Glove Linings

Wool and flannel are used for glove lining. A wool lining is usually considered more durable, has greater moisture-absorption ability and does not ball up and pull loose as easily as flannel. However, it is a more expensive type of lining. Cuffs are usually lined with canvas or duck, though other materials are sometimes used to meet special needs.

Gloves are usually sewed together with a glazed cotton thread. However, synthetic thread materials are becoming available, and undoubtedly a better thread will be developed for sewing welding gloves.

Because of the variety of materials and styles of gloves available, the purchase of a pair of welding gloves calls for both knowledge and judgment. If a wise choice is made, the weldor will be able to do better work under safe conditions and his gloves will last longer, too.

Remember that the average pair of gloves has a life of only two weeks. Anything you can do to better that life expectancy will save money.

Acres of Metal Show

This year's National Metal Exposition (popularly known as the Metal Show) will be held Monday Oct. 19 through Friday Oct. 23 at the Public Auditorium, Cleveland. The show will be open from 12 noon to 10:30 p.m. on Monday, Tuesday and Wednesday and from 10:00 a.m. to 6:00 p.m. on Thursday and Friday. Your AWS registration badge (or the membership card of any participating society) admits you.

The four sponsoring organizations will hold technical meetings throughout the week. The American Welding Society meets at the Hotel Cleveland, morning, afternoon and evening for the five full days of the week (see program beginning on page 45). The American Society for Metals will also hold morning, afternoon and evening technical sessions for five days at the Hotel Statler.

The Institute of Metals Division, American Institute of Mining and Metallurgical Engineers, will hold daily and evening technical sessions Monday through Wednesday at the Allerton Hotel. The Society for Non-Destructive Testing will hold morning and afternoon sessions Monday through Thursday at the Hotel Hollenden. The Public Auditorium is conveniently near to these hotels.

Special Features

The American Society for Metals will conduct a seminar on the relation of metal properties to microstructure on Saturday and Sunday, Oct. 17-18, at the Hotel Statler. This seminar will reveal the results of research into: structure and structure-sensitive properties; effect of grain boundaries on mechanical properties; principles of solution hardening; effect of dispersion on mechanical properties; theory of dispersion hardening; relation of corrosion to microstructure; relation of magnetic properties to microstructure, etc.

ASM will also sponsor its eighth Metallographic Exhibit, for which a large area within the Public Auditorium has been reserved. Eleven classifications of micros will be exhibited: (1) tool steels and tool materials; (2) stainless and heat-resisting steels; (3) other steels and irons; (4) aluminum, magnesium, beryllium, titanium and their alloys; (5) copper, zinc, lead, nickel and their alloys; (6) metals and alloys not otherwise classified; (7) series showing transitions or changes during processing; (8) surface phenomena; (9) results by unconventional techniques (not electron microscope); (10) slags, oxides and inclusions; (11) welds and other joining.

A first prize (medal and blue ribbon) will go to the best entry in each classification. A grand prize (engrossed certificate and $100 cash) will be presented for the best entry in the show.

Among the Exhibitors

Nearly five acres of floor space—210,000 sq ft—will be utilized by the over 400 exhibitors. A partial list, of firms concerned particularly with the welding industry, includes:

Acetogen Gas Co., Detroit; Alpha Metals, Inc., Jersey City, N. J.; American Brass Co., The, Waterbury, Conn.; American Chain & Cable Co., Inc., Bridgeport, Conn.; American Manganese Steel Div. of American Brake Shoe Co., Chicago Heights, Ill.; American Optical Co., Buffalo, N. Y.; American Wheelabrator & Equipment Corp., Mishawaka, Ind.; Ampco Metal, Inc., Milwaukee; Andreasen, Inc., Holger, San Francisco; Arcair Co., Bremerton, Wash.; Aronson Machine Co., Arcade, N. Y.;

Bausch & Lomb Optical Co., Rochester, N. Y.; Beryllium Corp., The, Reading, Pa.; Bridgeport Brass Co., Bridgeport, Conn.; Brush Development Co., Cleveland;

Cam-Lok Div., Cincinnati; Carboloy Dept., General Electric Co., Detroit; Carborundum Co., The, Niagara Falls; Champion Rivet Co., The, Cleveland; Chase Brass & Copper Co., Waterbury, Conn.; Crucible Steel Co. of America, New York;

Despatch Oven Co., Minneapolis; Diversey Corp., The, Chicago;

Erico Products, Inc., Cleveland; Eutectic Welding Alloys Corp., Flushing, N. Y.;

General Electric Co., New York; General Electric Co. X-Ray Dept., Milwaukee; Gregory Industries, Inc., Lorain, Ohio;

Handy & Harman, New York; Harnischfeger Corp., Milwaukee; Haynes Stellite Co., New York; Hobart Brothers Co., The, Troy, O.

International Nickel Co., Inc., The, New York; Invincible Vacuum Cleaner Mfg. Co., Dover, O.

K S M Products, Inc., Merchantsville, N. J.; Keleket X-Ray Corp., Covington, Ky.;

Lapeer Mfg. Co., Detroit; Lee Co., K.O., Aberdeen, S. D.; Lepel High Frequency Labs., Inc., New York; Lincoln Electric Co., The, Cleveland; Lindberg Engineering Co., Chicago; Linde Air Products Co., New York;

Magnaflux Corp., Chicago; Mallory & Co., Inc., P. R., Indianapolis; Mallory - Sharon Titanium Corp., Niles, O.; Manhattan Rubber Co., Passaic, N. J.; McGraw-Hill Publishing Co., Inc., New York; Metal & Thermit Corp., New York;

National Carbon Co., New York; National Torch Tip Co., Pittsburgh; Nelson Stud Welding Div., Lorain, O.; North American Philips Co., Inc., Mount Vernon, N. Y.; Norton Co., Worcester, Mass.;

Oakite Products, Inc., New York; Ohio Crankshaft Co., The, Tocco Div., Cleveland; Osborn Mfg. Co., Cleveland;

Pennsylvania Salt Mfg. Co., Philadelphia; Phillips Manufacturing Co., Chicago; Precision Welder & Flexopress Corp., Cincinnati; Progressive Welder Sales Co., Detroit;

Raybestos-Manhattan, Inc., Passaic, N. J.; Raytheon Mfg. Co., Waltham, Mass.;

Safety Clothing & Equipment Co., Cleveland; Sciaky Bros., Inc., Chicago; Selas Corp. of America, Philadelphia; Sherman Electric Co., Inc., Warren, O.; Smith Corp., A. O., Milwaukee; Smith Welding Equipment Corp., Minneapolis;

Taylor-Winfield Corp., The, Warren, O.; Tempil Corp., New York; Titanium Alloy Mfg. Div., New York; Titanium Metals Corp. of America, New York; Tracerlab, Inc., Boston; Turco Products, Inc., Los Angeles;

Union Carbide & Carbon Corp., New York;

Vlier Mfg. Co., Los Angeles;

Weldwire Co., Inc., Philadelphia; Weltronic Co., Detroit, Westinghouse Electric Corp., Pittsburgh; Worthington Corp., Plainfield, N. J.

1 Diver Frank Hefling, Underwater Salvage Co., is seated in carriage and leaving his diving shack

2 Riding the carriage down the ramp into the river and back up again saves the diver a lot of energy

3 A center section of the barge was the first part lifted. Too bad the camera couldn't go underwater

4 Hefling cut lifting holes in bottom of barge section to allow it to be hoisted to the river bank

5 The rake end, weighing close to 20 tons, really tested the capacity of the truck-mounted cranes

6 Oxyhydrogen underwater cutting reduced barge to 160 tons of scrap for mills of the Chicago area

He Cuts up Scrap on the River Bottom

Steel scrap is where you can find it. In this case the scrap was 26 ft under water at the bottom of the muddy Calumet River. Underwater cutting was the answer.

BY T. B. JEFFERSON

A STEEL hopper barge 26 ft wide, 175 ft long and 11 ft deep had sunk in the Calumet River at the point where it is spanned by a bridge used by five railroads. For over a year, this barge had constituted a menace to navigation. Its removal was the responsibility of the U. S. Engineer Corps, which advertised for bids to do the job. The Underwater Salvage Co., Chicago, the successful bidder, was given 75 days in which to get the barge out of the river. It was the biggest underwater cutting job the firm had ever tackled.

How It Looked

The barge had sunk in about 26 ft of water. It was right-side up and loaded with sand, coal and mud. The problem was to cut the 175-ft hull into pieces small enough to be handled by a truck-mounted crane.

Diving and underwater cutting come naturally to Frank Hefling, the man behind the Underwater Salvage Co. He set up a diving shack on the river bank. Hefling did the actual diving himself, assisted by a tender and a tender's helper. Two truck-mounted cranes and a winch truck were employed to lift out the sections after they were cut free.

The first task was to clear the barge of sand. This was done by high-pressure jetting. After sufficient sand had been washed away to clear a portion of the deck of the cargo hopper, the winch truck was employed to pull loose the wooden floor of the deck. The deck planks were heavy 3 by 12 in. oak timbers. Once they were out of the way, the steel was exposed for underwater cutting.

The job lined up about like this: The hull plates were mostly ¼ and ⅜ in., with some ⅝-in. plate on the rake ends, bilge plates and reinforcements. The bottom was of ⅜-in. plate, backed up with 10-in. channels. Both the longitudinal bulkhead and the transverse bulkheads of the cargo hopper were ¼-in. plates. It all added up to a considerable amount of cutting to be done underwater.

Underwater Railroad

When you are loaded down with 200 lb of diving gear, it is hard to climb ladders, even though only 20 ft of climbing are involved. After he had made a few preliminary dives, Hefling thought of a better way to get down to and up from the river bottom. He built a carriage to run on a ramp on a cable fastened to an air-operated winch. Without any effort whatsoever on his part, Hefling could easily ride down from his diving shack to the sunken barge in a few seconds. He could come back up just as easily.

Some of the mechanics of this underwater railway may prove of interest. The lower end of the ramp was fitted with pontoons (three oil drums). When these were filled with water, they would carry the lower end of the ramp all the way down inside to the bottom of the scow. The ramp could be floated to any desired level by expelling the water in the drum. Compressed air did this easily to any degree required.

The barge was submerged so that the sides made an angle of about 20 degrees with the river bottom. However, the cutting of the sides and the hopper compartment presented little in the way of problems. Cutting was done much as though the barge was on dry land.

Working under Pressure

The most difficult part of the entire job was to flame-cut the bottom of the barge. The bottom rested in mud and was also partially covered with sand. Hefling had to jet a path through the sand and complete the flame-cutting before his small dredged-out path could become filled again. That took fast work. You might call it working under pressure—if the pun can be pardoned.

After the sections of the barge had been cut loose, Hefling cut lifting holes to which the crane slings could be attached. The section was lifted and turned over. Hefling cut additional holes in the bottom so that a sling could be attached. Then the entire section was lifted from the river.

In general, the aim was to cut out 10-ton or 11-ton sections of the barge. The two rake ends, however, were each lifted as a unit weighing about 20 tons.

How It's Done

Fundamentally, an underwater cutting torch is similar to the conventional oxyacetylene hand cutting torch. There is, however, an extra hose to carry compressed air since the flame can burn underwater only when it is surrounded by an air bubble. Provision must also be made to supply more heat than is needed for dry-land cutting. The thermoconductivity of water is approximately 40 times that of air, so you can see why a large amount of heat is dissipated rapidly.

Naturally, the preheat flame must be shielded from contact with the water. While this can be done in several different ways, the best method is to surround the cutting tip with a bell, into which the stream of compressed air is fed.

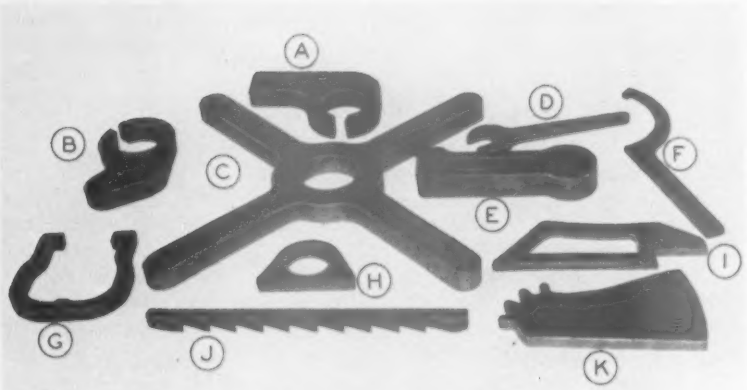
Hefling, who has helped to develop one of the original torches used for underwater cutting, selected a four-hose torch for this job. The four hoses carried hydrogen, preheat oxygen, high-pressure cutting oxygen and compressed air.

Hydrogen was selected for the fuel gas. Acetylene might have been used, but because the water depth approached the limit of safety for acetylene pressure it was decided to take no chances. To overcome the increasing water pressure of 4.5 psi for every 10 ft of depth, acetylene has to be compressed more highly than is usual in dry-land cutting. In this condition, it gets very sensitive and is apt to explode in the hose if the coil is handled roughly.

(Continued on page 60)

1—PLATE is cut here in the A. M. Castle & Co. Los Angeles warehouse

From Steel Plates . . .



3—SOME of the parts. Explanation of the letters will be found in text

. . . to Flame-Cut Parts

A. M. Castle & Co., Los Angeles, devotes some 120,000 sq ft of floor space to the purpose of giving its customers exactly what they want in the way of steel.

BY FRED M. BURT

With headquarters in Chicago, A. M. Castle & Co. also has large warehouses in Rockford (Ill.), Seattle, San Francisco, Berkeley, Los Angeles, North Kansas City, Milwaukee and Baltimore. In this article, however, we will be concerned only with operations in Los Angeles. Flame-cutting, precision grinding, stress relieving and other heat treatments are available as ordered. The Castle service may be likened to that of a one-stop supermarket, where everything that a household needs can be procured at one convenient location.

Shape-cutting Machines

Flame-cutting is of basic importance. Four multiple-torch shape-cutting machines of the pantograph type are grouped together in one bay of the warehouse (photo 1). Three of these are very large machines operating on 8 by 20 ft cutting tables. Tracing heads are electronically controlled, magnetically controlled or operated manually. A two-torch machine, also of the pantograph type, operates on a 2 by 6 ft cutting table and has a manually operated tracing head. Finally, there is a single-torch machine with a cutting table 24 in. square and a magnetic tracer guided by steel templates.

The company also has several motor-driven carriage machines for straight-line cuts and circles. Table facilities allow straight cuts that are up to 30 ft long. Although A. M. Castle doesn't stock plate more than 10 in. thick, the Los Angeles warehouse can do precision cutting on plate that is of even greater thickness.

In photo 2, we can see the largest of the shape-cutting machines. The electronic tracer is at the right of the picture; the cutting table at the left, and the operating bar that carries the torches is immediately in front of the carriage. This machine can be used to cut an unlimited variety of shapes from steel plates or to cut slabs, billets and forgings. It operates on the pantograph principle so that one or many cutting torches conform exactly to the movement of the electronic tracer. The operating bar will hold a uniform load of 500 lb or concentrated load of 400 lb.

Electronic Controls

Though the principle of electronic tracing has been described before in The Welding Engineer, it might be a good idea to review its chief principles. The only template needed is an outline drawing with a heavy black line on a white background (or a white line on a black background—the contrast is all that matters). The electric eye follows this outline automatically. Light from a bulb inside the tracer head passes through an optical system to form a small round spot of light. This spot is continually

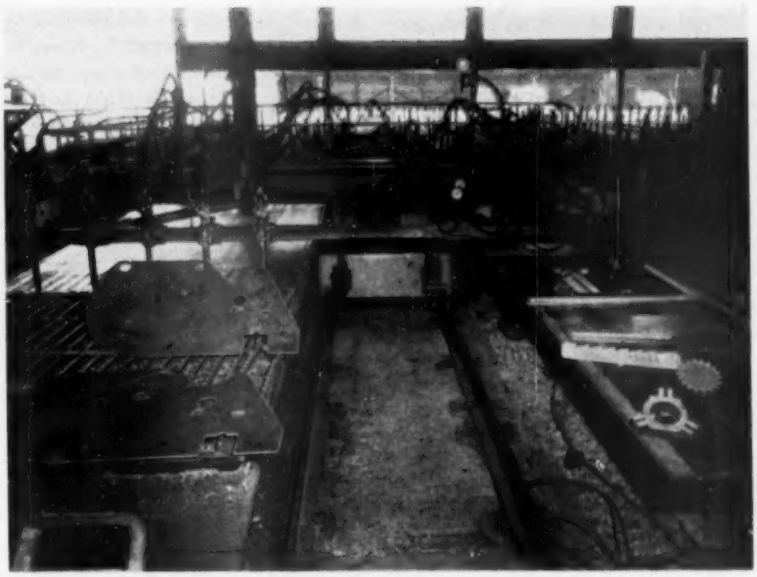
positioned so that it is half on the white background and half on the black line.

The light reflected back from the spot is picked up by the photo-electric tubes that control the movement of the steering motor. Whenever the spot is not in the proper half-and-half position, it is immediately brought back "on the beam." Inside and outside square corners, obtuse and acute angles, long slim projections, narrow slots and intricate contours are all easily handled by this tracing method.

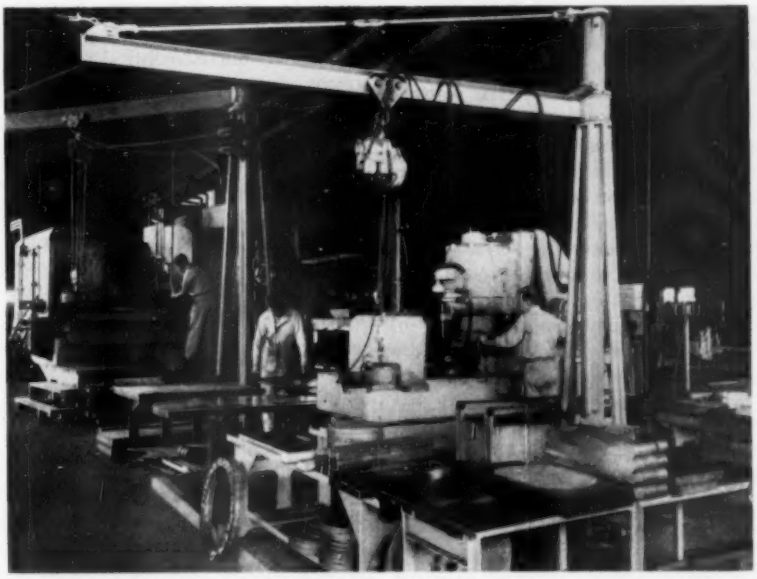
The carriage travels on two steel rails between the tracing and cutting tables. The carriage drive is regulated by an electronic motor control that allows smooth changes in traveling speeds over a range of from 2 to 168 ipm, forward or reverse. The electronic carriage control permits the torches to be quickly positioned when it is necessary to make widely separated cuts in a large plate.

The other pantograph-type cutting machines operating on 8 by 20 ft tables can be used to cut as many as seven identical parts at one time. One of these machines also uses an electronic tracer. The other uses a manual tracing head, in which a knurled wheel follows the outline of a full-size drawing, or a magnetic tracing head that automatically follows a steel template. The magnetic tracer has a rotating roller that is held by magnetism against the edge of the steel strip. This is an economical method of flame-cutting for production operations if the run is large enough to justify the expense of a template. Castle makes the steel patterns from strips 3/16 and 1/4 in. thick.

Smaller shape-cutting jobs are done on the single-torch and two-torch machines, while the straight-line machines add the cuts to which they are best suited. All of this mechanized equipment puts the Los Angeles warehouse in an exceptionally fine position to meet customer requirements.



2—LARGEST shape-cutting machine has an electronic tracer and can cut many similar parts at once. Carriage speed is electronically controlled



4—GRINDING is done, too. The 84-in. diameter rotary surface grinder is at the left, while the smaller 40-in. diameter grinder is up in front

Some Flame-Cut Parts

Photo 3 shows just a few of the parts that have been cut to meet customer specifications. Parts (A) and (B) are eccentrics for hook-weighing scales; these parts are 10 in. long and were cut from 1¼ in. plate. Part (C) is a spider 24 by 24 in. cut from 1½-in. plate. Part (D) is a wrench 12 in. long from ½-in. plate. Part (E) is a cam 10 in. long from 2 in. plate. Part (F) is a spanner wrench 17 in. long from ⅜-in. plate. Part (G) is a clamp 6 by 7 in. from ⅝-in. plate. Part (H) is a gussett 6 by 8 in. from ¾-in. plate. Part (I) is a spacer bar cam 4 by 12 in. from ½-in. plate. Part (J) is a ratchet 18 in. long from ¾-in. plate, and part (K) a cam ratchet 10 in. long from ¾-in. plate.

Cutting times on these parts ranged from 9 minutes (H) up to 20 minutes (C). Some parts were cut to a tolerance of ±1/32 in. and others to a tolerance of ±1/64 in. The number of torches on the machine varied from 1 to 8 torches. When steel templates were necessary, they were made by A. M. Castle & Co. from customers' blueprints and/or sketches.

These eleven cut parts make only a beginning to the Castle flame-cutting story. It is impossible to enumerate the many different shapes and sizes of steel that are cut to meet exact specifications. The cutting is done with

natural gas and oxygen, which provides a flame with a temperature of about 2,200 F. Oxygen is stored in two bulk delivery units, each with a capacity of nearly 11,000 cu ft, and piped to points of use. The fuel gas (1,100 B.t.u.) is piped to the same points from the regular natural gas pipelines.

To round out the cutting service, there are two power-driven hack saws (used on 10-in. to 13-in. rounds), two 10-ft power shears (for 10-gage sheet up to ½-in. plate) and a friction saw. The friction saw is 58 in. in diameter and is driven by a 125-hp motor at 1,700 rpm. This saw will slice through a 12-in., 65-lb I-beam in 35 to 40 seconds. Calculations show that about 19,000 of the blunt teeth (four teeth per inch of circumference) take their tiny bites out of the metal every second.

Grinding Done, Too

Added to the versatile cutting service is a fine grinding service that aids materially in conforming to customers' most exacting specifications. There are two rotary-type surface grinders (photo 4): one 84 in. in diameter and one 40 in. in diameter. Work is brought to the larger grinder by a jib crane carrying a two-ton electric hoist with a magnet of 3,500-lb lifting capacity. The 40-in. grinder is serviced by a one-ton hoist having a 1,000-lb magnet. Grinding is done to tolerances as close as ±0.002 in. Chet and Steve Schafer are the key men in this department.

Castle stresses to its customers that their specifications should be both complete and exact. If a part of 1-in. plate is ordered, for example, it should be specifically stated whether this thickness means exactly 1 in. or allows mill tolerances, which may be ±1/32 in. The same character of close tolerances can enter into flame-cutting specifications, with further refinement through subsequent grinding. Castle tells its customers: "If precise dimensions and/or flatness, parallel surfaces, etc. are desired, they should be specified."

The Los Angeles warehouse is under the supervision of Superintendent Floyd Suddith. The steel-and-glass building is divided into four bays, each 70 ft wide by 390 ft long. Full-span cab cranes, of 5-ton or 10-ton capacity, handle the steel in each bay.

The warehouse stocks: steel sheets, hot and cold rolled, galvanized, vitreous enameled, electrical, high-tensile, etc.; steel shapes including rounds and bars; tubes and welding flanges; stainless-steel sheets, tubes and shapes; high-speed tool bits; drill rod; wire rope; plates for miscellaneous uses including stair treads and probably many other items that were missed by this reporter.

SCRAP FROM RIVER BOTTOM

(Continued from page 57)

Another danger comes from the fact that the oxyacetylene flame is somewhat unstable and is easily extinguished. When this occurs, acetylene and oxygen escape from the torch and bubble through the water to the surface. The bubbles can easily be ignited, resulting in an explosion both above and below the water. Hydrogen is much safer because the oxyhydrogen flame is almost impossible to extinguish even by poor manipulation of the torch.

One of the difficulties that confronts the diver doing underwater cutting is that it is nearly impossible for him to see whether or not the torch flame is actually burning the steel. The flame is practically invisible due to the black water. In muddy water (such as the Calumet River), even the sparks of molten steel are hard to see. Hence the great importance of a stable flame.

Underwater Precautions

Certain precautions necessary for underwater cutting were all carefully observed. The first precaution, the most important of all, is to be sure that adequate gas pressures are employed. Naturally, pressures must be higher than are ordinarily used on land. Practical experience seems to suggest the use of 100-psi pressures all around for ease in maintaining regular cutting pressures.

Next underwater precaution is to provide an adequate preheat. Here we get into a strange world, governed by weird laws of its own. It is not logical that a light-gage sheet requires approximately the same preheat in gas volume and in time as does a plate an inch or more in thickness. However, experience has shown that this is true.

When you start to preheat underwater, hold the torch so that the upper rim of the bell touches the metal to be cut. After the metal has been sufficiently preheated for you to start the cut, be sure to press the torch bell firmly upon the metal to hold the compressed air around the cut. The air, traveling with the high-pressure oxygen, will escape through the kerf as the cut is being made. Both the high-pressure oxygen and the compressed air will be heated somewhat by the preheating flame under these conditions, which will help to prevent undue dissipation of the heat by the surrounding water.

A man doing flame-cutting on land certainly would not be inclined to place his hand around the torch head while the flame is burning. Yet this is what the diver does. There is no danger underwater, and he can hold the torch steady and manipulate it more easily than in any other way. Once a cut has been started, it can continue fairly rapidly. On this job, the average rate was around one foot per minute.

Altogether, the job involved 1,000 ft of underwater flame-cutting. Less than ten days were spent in the cutting operation. About 100 cylinders each of oxygen and hydrogen were consumed, an average of about 10 cylinders a day of each gas.

The removal of this obstruction not only cleared the river channel but also provided some 160 tons of steel for the scrap-hungry furnaces of the Chicago area. The success of the operation was due entirely to the underwater flame-cutting process—and to Frank Hefling's skill with the cutting torch.

"SOME WOMAN CLAIMS SHE HAS A TOUGH CANARY."

ONE GUY came running up with a big fire hose and turned it on him . . .

Old Ket Gets on Fire

If there is anything worse than a hot foot, it's a hot belly. Liquids don't always put out a fire either.

BY CLEMENT HOWARD

REPAIRS were running in the usual pattern at the bus garage. Everything was lovely until the day when our friend Old Kettlehead walked in and bellowed: "I'm the best damn weldor who ever spit tobacco juice on a welding bead."

He was good, too, but he was a whiskey-laden, overbearing guy who liked to ride the daylights out of some poor joker whenever he got a chance. If he couldn't foul up a weld by stepping on somebody's hose, he'd remove the ground cable from some guy's machine. He welded some of the fellows' lunch buckets closed, and a couple of times he ruined the thermos jugs doing it. When he put the empty rubber balloons in an apprentice's tunafish and mayonnaise sandwich, however, the gang figured things had gone far enough.

Yes, sir, everybody thought it was about time to cut Kettlehead down to size. It took the combined efforts of everybody in the shop to arrange a program, but what a program it was!

License with Licenses

The new transcontinental buses were the pride and joy of the fleet. Everything possible had been done to lighten their weight. This was done to increase their speed and reduce fuel consumption, but it also helped to decrease license fees in various states. One particular spot that had been lightened gave the gang an idea.

Most buses carried several license plates, and naturally the brackets had been made of a light metal. They were continually being broken, and the mechanics always threw them away and installed new ones in their place. All of the weldors knew of what metal they were made of except Old Kettlehead.

A couple of days after the sandwich deal, the shop superintendent brought in a license bracket and handed it to Ket. "Weld up this aluminum license bracket," the super says. Our boy told the super he could gas weld aluminum with his eyes closed and then went off to the grinder.

While he was gone, the gang started climbing on top of buses and vantage points inside. They even got up in the rafters.

Pretty soon Ket had the pieces prepared. He swaggered up to the bench and laid down the parts in perfect alignment. Then he grabbed some aluminum rod and flux and went to town. He really did a job on that bracket; everybody admitted he could handle the torch, rod and puddle like the proverbial "Tinkers to Evers to Chance."

The super asked him to cool the welded bracket and give it to him. Poor Ket's mouth fell open a foot when the super nonchalantly pulled the joint apart with his *bare* hands.

"You didn't have good penetration," the super said. "You gotta get it hotter. Pour the heat to it good!"

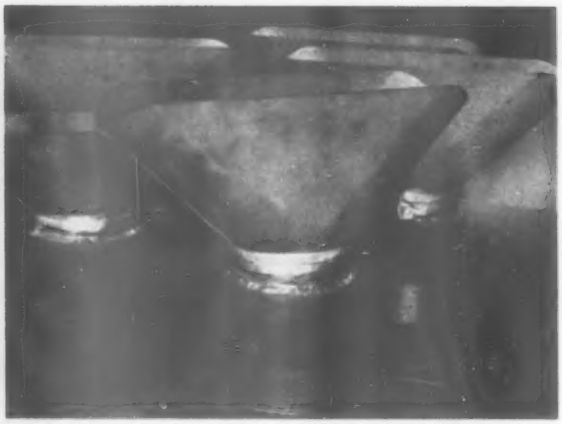
Old Ket went at it again. Pretty soon a small amount of metal fell away, and some guy hollered, "Pour the heat to that and push it back to the vee with the flame from your torch." Old Ket followed this advice and, brother, all hell broke loose! The little bit of metal in the puddle caught on fire and started to burn just like a flare or a giant firecracker with the fuse pulled out. Ket got a perturbed look on his face that a thousand words would never describe. Then, as if by prearranged signal, everybody started running in every direction. Some were hollering "Fire! Fire!", while others were yelling "Water! Water!" or "Call the fire department," or "Run for your lives." Pandemonium really ran rampant. While all this was going on, some joker came up out of nowhere and threw a bucket of water on Ket and the bracket. You shoulda seen the sparks fly then! That darn metal flared up and almost scorched Ket's five-day growth of whiskers. Sparks were flying everywhere, and some of them got down inside his pants and even into his cuffs. Here he was soaking wet, slapping himself like mad on his pot belly, and still smoking in spots.

The show got funnier. One guy came running up with a big fire hose and turned it on him. Somebody did call the fire department, and they came bells ringing, sirens wailing and all. Poor Old Ket simply couldn't take it and headed out the side door for parts unknown. However, the super saw him leaving and went after him. He brought him back and talked him into sticking around, for, after all, Ket was a pretty good weldor. Besides the joke wasn't finished.

The apprentice that had nearly eaten the rubber balloon in his tunafish sandwich was elected to deliver the final blow. He goes over and gets the same bracket, right where the gang had hung it over Ket's station after the fire was out. He prepared it

(Continued on page 70)

1—CARBON ARC is employed to weld an outlet made of 20-gage sheet metal to standard-weight 4-in. pipe



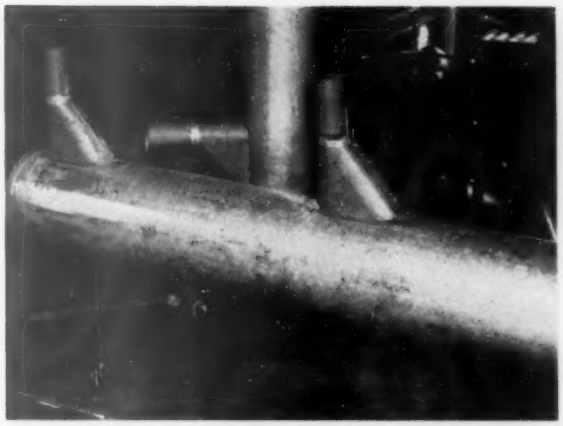
2—WELDED parts made as shown by photo 1. Rounded portion of sheet-metal outlet slips down inside pipe

Thin Sheets to Thick

5—TUBES rolled from 20-gage sheet were welded to threaded lengths of 2-in. pipe by a tack on each side

6—ONE-INCH welds every 6 in. join stiffening angles to ducts fabricated from 14-gage galvanized sheet

7—ERNEST SCHMIDT, United Sheet Metal foreman, is pointing to one of the welds joining conduit sections



3—SMALL tack welds made every 3 or 4 inches will provide all the strength needed in these connections

4—WELDOR is now faced with the job of welding a 2-in. standard-weight pipe to the sheet-metal header

Pipe—Not Difficult Here

Here's a tough problem in sheet-metal welding: How do you get sufficient heat for fusion into a standard-weight pipe without burning through thin sheet metal?

BY ROBERT THOMAS
Welding Engineer,
The Lincoln Electric Co.

UNITED Sheet Metal Co., Philadelphia, makes and installs industrial air piping systems. These frequently involve the welding of galvanized or black iron sheet metal to heavy pipe connections. When you are joining thin sheets to relatively thick metal such as a standard-weight pipe, it is difficult to get sufficient heat for fusion into the pipe and yet prevent the sheet metal from being burned through. United Sheet Metal has solved the problem in an interesting way: by using the carbon arc with a copper-alloy rod.

Filler Arc Process

The 3/16-in. carbon electrode is held in an ordinary electrode holder, while welding current is supplied from a 150-amp d-c welder. The weldor simply feeds the copper rod into the arc. By directing the arc mostly into the pipe or heavier metal section, he gets proper fusion there and keeps the heat away from the sheet metal. It is simple to control the relative heats in the two sections to produce smooth, uniform welds. Distortion and warpage of the sheet metal is avoided.

The welding rod is held at an angle of about 15 deg with the horizontal and is fed in at a rate to produce the desired size of weld. In photo 1, the weldor is joining a 20-gage outlet to a piece of standard-weight 4-in. pipe. The round portion of the sheet-metal outlet slips down into the pipe and is welded to the pipe's top edge. The carbon arc is directed more onto the pipe, and a satisfactory fusion of thin and thick members results. Completed parts are shown in photo 2.

Other Sheet-Metal Jobs

The carbon-arc process is also employed for the complicated sheet-metal assemblies pictured in photo 3. Small tack welds every 3 or 4 in. provided sufficient strength in the take-off connections. The joints were then soldered to secure tightness.

On one side of these sections of air piping, a short length of threaded 2-in. pipe of standard weight had to be joined to the sheet metal. This pipe outlet was welded on with the carbon arc as shown in photo 4.

In photo 5, tubes rolled from 20-gage sheet have been welded to pieces of 2-in. pipe. All that is necessary is to make a tack weld on each side of the circumferential joints in the sheet. These tacked joints and the longitudinal crimped joints are then soldered for tightness. The carbon-arc process also played a part in fabricating the sheet-metal tubes.

Rectangular Ducts

Another application is for the joining of stiffeners and similar heavy members to ducts of rectangular cross-section. Photo 6 shows a ventilating duct of an industrial oven. The duct, of 14-gage galvanized sheet, was fabricated by arc welding with E-6012 electrodes. The angle used for stiffening and supporting was welded to the sheet by a series of 1-in. welds spaced every 6 in.; these welds were made by the carbon arc.

Fabrication of the 10-in. conduit sections pictured in photo 7 was simplified by the carbon-arc process. These sections were formerly riveted, but now four 1-in. welds per joint do the job. Foreman Ernest Schmidt is pointing to one of these intermittent welds. Each section is rolled, crimped longitudinally, slipped into a slightly larger adjoining section for a distance of 1 in. and then tack welded at the 90 deg points.

In all welding with the carbon-arc process, the d-c welder is connected for straight polarity. The welding current varies from 50 to 150 amperes, depending upon the material.

1—FIRST weld has been completed at right. Outer top (left) fits over the smaller-diameter inner shell

2—SECOND weld joins shell top to inner shell. By making weld in a vee-groove, a flat surface is assured

Good Things Come

New submerged-arc-welded condensers for commercial air conditioning systems are two-thirds the size of former units manufactured by the General Electric Co.

Two welding set-ups, each equipped with an automatic welding head and the necessary jigs, perform the four operations that are necessary to provide the hermetically sealed condenser unit used in a commercial air conditioning system. The shells that house the compressor and condenser are made airtight by submerged-arc welding. An interesting production trick is the deposition of one circumferential weld into a machined groove in order to assure a flat surface that needs no finishing.

The halves of each shell are deep-drawn from ¼-in. steel plate. The fabrication of the housing begins with the continuous 37½-in. fillet weld that joins the inner shell to the bottom half of the outer shell. This weld is shown completed at the right of photo 1. On the left of the same picture is the shell top that fits over the smaller-diameter inner shell.

Operation 1: The bottom half of the outer shell and the inner shell are placed in a jig on a rotating fixture set at a 45-deg angle. The submerged-arc welding head is mounted in a fixed position. Welding is done at a speed of 12 ipm, using 360 amp, d-c reverse polarity. Welding wire is 3/32 in.

Completed weld appears at right of photo 1. The jig and welding head are pictured in photo 2.

Operation 2: The shell top pictured at the left of photo 1 is welded over the smaller-diameter inner shell at the right. This welding operation is pictured in photo 2. A circular V-groove is machined into the top of the outer shell to a depth of two-thirds the metal thickness. This groove assures a flat weld. The weld penetrates through the top shell and into the inner shell to about one-half its thickness.

After water coils have been encased in the shell top, the parts are assembled in the fixture shown in photo 2. The shell top is positioned so that it rests above the smaller-diameter inner shell like a dome or canopy. The fixture table is tilted at 20 deg so the weld surface will be level. A one-pass weld is applied to the grooved circle. Controls are set at 365 amp, d-c reverse polarity. Welding time required is one minute.

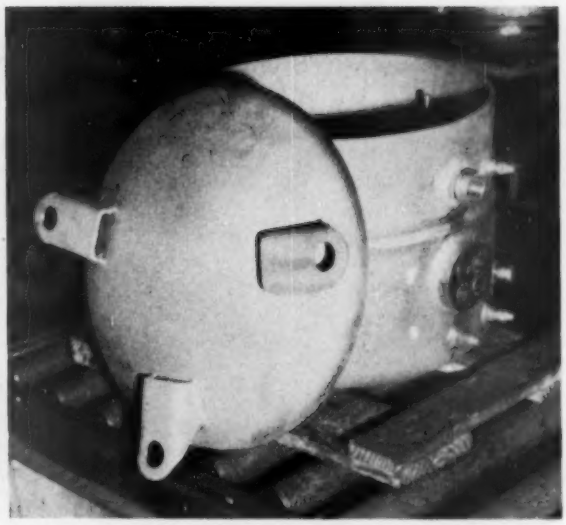
The weld that results from this operation is pictured in photo 3. The weld is level with the surface of the shell and requires no finishing.

Operation 3: A lap joint is made between the top and bottom of the outer shell. The assembly previously welded in operation 2 is mounted with the shell bottom on a lathelike welding fixture that turns the work beneath a fixed submerged-arc head. A slide rail supports the welding head parallel to the work so that it can be positioned easily. The circumferential lap joint between the outer shell halves is fillet welded in one pass. The weld is made in 56 seconds at 430 amp with a ⅛-in. welding wire. The operation seals in the water coil assembly.

The condensing unit at this stage appears on the right of photo 4. The roller conveyor takes the welded assembly to the next production station, where the working parts of the compressor are inserted.

Operation 4: The final welding

3—WELD penetrates through outer shell top, joining it to the inner shell that houses the compressor



4—THIRD weld (at right) joins the top and bottom halves of outer shell. Bottom cap appears on the left

in Small Packages

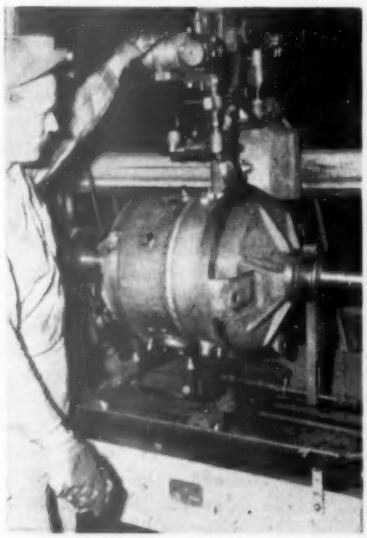
operation is to weld the bottom cap to the outer shell. The bottom cap appears on the left of photo 4. Besides making the unit completely airtight, it also serves as a base or stand for the compressor.

The unit is replaced in the horizontal fixture used for Operation 3 and is turned for making the circumferential weld (photo 5). Welding procedure for this lap joint is the same as for the preceding operation except that two passes are made. Total time is 106 seconds. Photo 6 shows the finished weld. This is the final step in fabrication of the condenser unit.

Inspection: The unit is completely immersed in a tank of water, and high-pressure air is forced through hoses connected to outlet plugs (photo 7). The ease with which most condensing units pass the test is a fine testimonial to the quality of the welding performed at this General Electric plant. The approved units are then painted, packed and shipped. Skilled workmanship combined with precision welding equipment is producing a steady flow of this product.

These welded condenser units are only two-thirds the former size. Good things come in small packages.

Photos courtesy Linde Air Products Co.



5—FOURTH weld is made to join bottom cap to the rest of housing

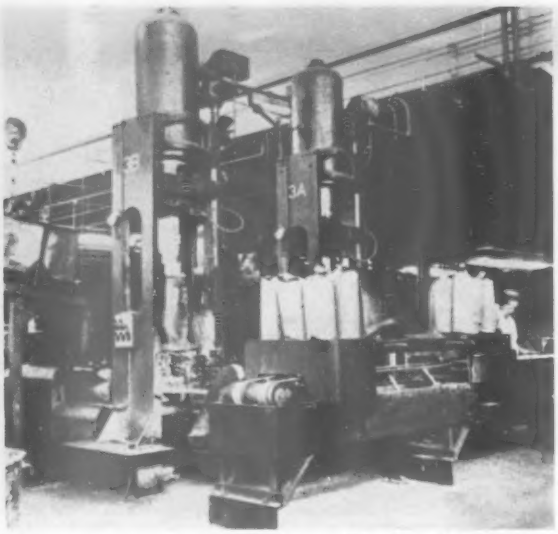
6—COMPLETED two-pass weld hermetically seals condenser unit

7—AIR is forced into the submerged units to find the leakers

PART TWO: Test of the designer's work comes when you switch from the laboratory to the production line.

Courtesy National Engineering Co.

MIXING is a prerequisite to good electrode performance. Muller-type mixer does both dry and wet mixing



Courtesy Arcrods Corp.

TWIN presses for high-pressure extrusion deliver a continuous flow of coated electrodes ready for drying

What Goes into a

More than chemical ingredients are needed, more than physical properties carefully balanced.

BY D. L. MATHIAS
Research Engineer, Arcrods Corporation

Tens of thousands of pounds of welding electrodes are consumed every day, yet very little has been published on the subject of electrode design and formulation. Mr. Mathias seeks to remedy that situation.

The three steps by which electrodes are conceived and developed along scientific lines are: (a) selection of chemical ingredients, (b) selection with respect to physical properties and (c) the working out of a production procedure. In the first step, when the materials are considered on a chemical basis, it must be borne in mind that an electrode coating has five main jobs:

(1) To shield the arc stream and the weld deposit.

(2) To provide an ionized path to maintain the arc.

(3) To deoxidize the weld deposit.

(4) To introduce alloying elements that will contribute specified properties to the weld deposit.

(5) To provide a suitable slag.

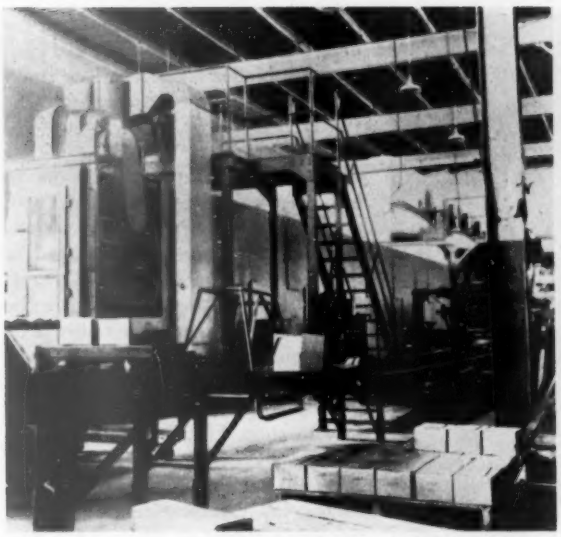
*The materials best suited to perform each of these duties were discussed by Mr. Mathias in his first installment (*THE WELDING ENGINEER, *August 1953). The second and concluding installment takes up the physical formulation of a coating composition and the effect of various physical factors upon the five duties of the electrode coating. Even when the coating has been satisfactorily developed in the laboratory, there still remains the almost equally big problem of adapting the formula to large-scale production.*—The Editors.

AFTER a coating composition has been formulated on a strictly chemical basis, we turn to physical formulation. The component materials must be considered with respect to their physical characteristics in order to control the rate and/or extent to which various reactions proceed. The major properties with which we will be concerned are particle size, particle shape, melting point, hygroscopicity (capacity to absorb moisture), compatibility in combination with other materials and ability to respond to processing procedure.

Let us look at a specific instance of the problems of physical formulation. With conventional electrodes, particularly with those having high-cellulose contents, the effectiveness of the shielding materials depends upon the protection given against premature decomposition and upon formation of a crucible of optimum depth. This is accomplished by properly balancing the grade and amount of the soluble silicate binder with the cellulose. The combination is then processed to develop a dense structure and yet one that can be readily dried. Finally, drying is done so as to retain a definite water content.

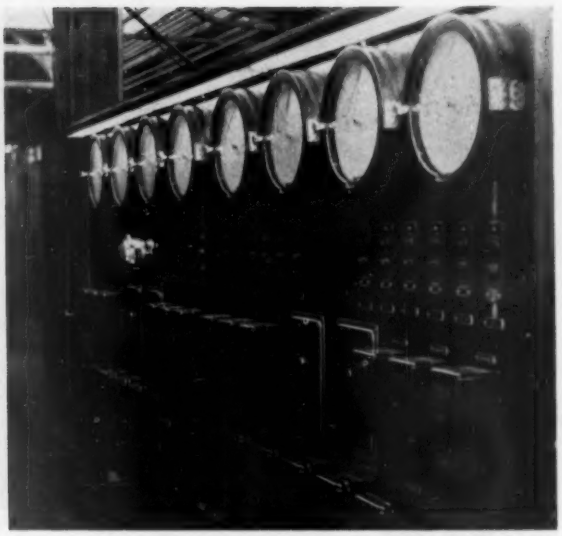
WHY WATER IS NEEDED

During welding, the flow of current through the core wire causes the latter to be heated appreciably throughout its length. This would result in premature decomposition of the cellulose were it not for the water content. Through evaporation of a portion of the water, the cellulose is protected against complete decomposition until it reaches the refractory crucible that is formed in the flux



Courtesy Arcrods Corp.

TRAVELING 700 feet through the drying oven, electrodes are dried to develop their optimum performance



Courtesy Arcrods Corp.

TEMPERATURE of oven heater and various zones of drying oven are individually controlled and recorded

Welding Electrode?

covering. Here the remainder reacts with the partially decomposed cellulose to convert it to a gaseous form. All conventional electrodes that contain cellulose depend upon the presence of some water to control decomposition. While some types of conventional electrodes require dense coatings, others are designed with coatings with a variable degree of permeability, depending upon the arc stability and arc energy the electrode must have to meet application requirements.

Low-hydrogen electrodes are different. They depend upon carbonates for shielding to avoid the presence of hydrogen in the arc envelope. Water is not wanted as it is a source of hydrogen. To prevent premature decomposition of the shielding material, it is necessary to resort to means other than that just described for conventional electrodes.

Calcium carbonate is the material generally used for shielding low-hydrogen electrodes. Generally, it decomposes at a temperature of approximately 1,500 F, but in the presence of other materials it may decompose at a temperature low enough to introduce serious problems in either production or use. Calcium carbonate is also quite reactive with soluble silicates used as binders and impairs their adhesive strength.

Both of these problems are materially reduced by selecting the grade and granulation of calcium carbonate that is best suited to electrode use.

Heavy loading of an electrode coating with coarse materials prevents the designer from obtaining the degree of plasticity that is required for satisfactory production. It is the designer's job to balance the coating materials with regard to both the physical characteristics desired and the ability of the composition to respond to processing.

Problem of Permeability

For another example, the protection of the arc stream against atmospheric contamination, the ionization of arc-stabilizing materials, the water-gas reaction of the organic residue and the efficiency of alloy transfer, all involve compounds or elements in the gaseous form. The efficiency of these various coating functions is influenced to an appreciable extent by the permeability (penetrability) of the coating.

If you are dealing with the dry ingredients of a coating, before the addition of the binder, an aggregate composed largely of coarse materials has higher permeability than one composed of both coarse and fines proportioned to give a minimum of voids. An entirely different situation exists with the addition of binder and after the coating has been dried to the optimum moisture level.

At normal atmospheric temperature, a thoroughly mixed wet flux is a homogeneous mixture of binder and dry materials, a mixture stiff enough to require high pressure for extrusion. The binder may be viscous as used, or the coating may be processed to develop the degree of plasticity required for production. As the electrode is heated during the early stages of drying, the viscosity of the binder drops sharply; *i.e.*, it is thermoplastic. At the same time its moisture content is reduced by evaporation from the surface of the coating. Mobility of the binder is thus increased by a rise in temperature, and the binder tends to move to the surface under the influence of evaporation. Because of this migration of the binder, a concentration of binder solids occurs near the surface of the coating. Naturally, such a concentration

Courtesy General Electric Co.

CLOSE-UP of a-c arc shows good metal transfer with an absence of arc blow

lowers the permeability of the coating.

Migration of binder is an important consideration because of its effect upon operating characteristics (Fig. 1). It may be controlled, to the extent that production facilities permit, through selection of temperature and humidity during the early stages of drying. However, the selection of a flux aggregate with respect to the optimum proportion of coarse and fine material and the selection of binder of suitable viscosity will give the desired end-point.

Pulling in Two Directions

Water, as we have seen, is an essential ingredient of the coating of all electrodes that contain cellulose. It tends, however, to destabilize the arcs of electrodes designed for use with alternating current since the hydrogen that results from the dissociation of water (and cellulose) has a high ionization potential. On the other hand, hydrogen is useful in controlling arc energy because it offsets the low ionization potential of materials that impart stability to an a-c arc. A paradox indeed! Use of these dual but opposite characteristics of hydrogen may seem impractical, yet electrodes with a high content of both water and cellulose have given excellent performance.

Arc stability and arc energy are both influenced by the distribution of materials in the coating, including materials of both low and high ionization potentials. Arc-stabilizing materials that are introduced as insoluble solids should be in the finest possible state of division. This applies to compounds of calcium and barium when used specifically for that purpose. Potassium, one of the most effective stabilizers for a-c electrodes, is best introduced through the binder as a soluble compound. It is important that both dry and wet mixing be very thorough to avoid local concentrations of water-containing materials, which upon decomposition will release an excessive amount of destabilizing hydrogen.

In Part One of this series, we saw how ferro-alloys are employed as deoxidizers and as alloying additions. The efficiency of transfer of most ferro-alloys becomes progressively higher as the particle size is increased (Fig 2). However, there is a limit to the maximum size that can be tolerated, both with respect to smoothness of arc action and to the dispersion of the alloy in the weld deposit. Small-diameter electrodes are more apt to be adversely affected by coarse metallic particles than are large-diameter electrodes. Similarly, electrodes classed as "cold" or of low penetration are more susceptible to the granulation of ferro-alloys than "hot" or deep-penetrating electrodes.

Particle size and shape of the major slag-forming materials are important considerations in electrode design. Binder migration, because of its effect upon permeability, is an important factor in the diffusion of the gases that protect the arc stream and provide an ionized path for the arc. Materials having platelike structure tend to cling fish-scale fashion on the outer surface of the coating and thus augment binder migration. The result is a coating of low permeability.

Production Problems

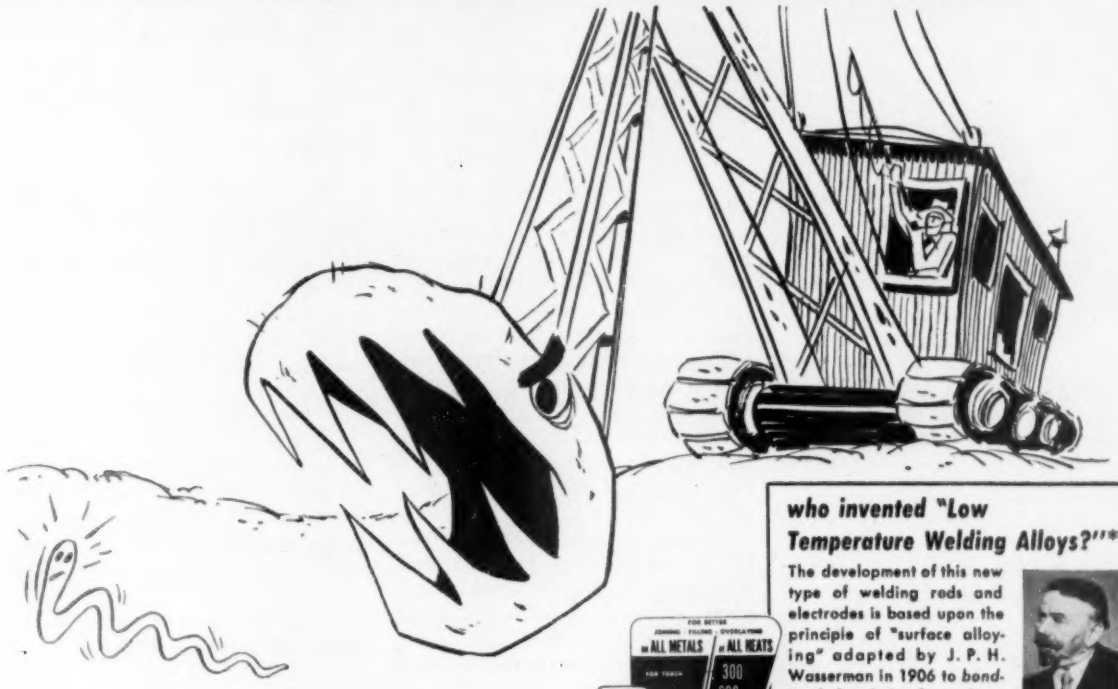
Up to this point, electrode design has been considered primarily with respect to the laboratory. The various solutions that have been reached to the problems as they arise are all laboratory solutions. What can be done on a small scale can't always be accomplished on a production basis.

Not infrequently, fresh problems arise during the transfer from laboratory to shop. Electrodes made in the shop may differ appreciably in operating characteristics from those made in the laboratory. For this reason, the development or design of a new electrode cannot be considered complete until it has been successfully run on the production line.

This phase of electrode development might be called "process formulation." It usually involves a reconsideration of chemical composition and/or physical characteristics of the coating. Consideration of processing procedure as a phase of design may seem to be irrelevant to this discussion. Such would be the case if it were possible to provide laboratory facilities that would duplicate the conditions of full-scale production. Unfortunately, it is not possible to set up experimental equipment comparable to production equipment unless it is matched in size and capacity, an impractical condition.

We have seen how binder migration, flux permeability and moisture content are related to mixing and drying. Flux batches employed in production are many times the size of those used in the laboratory. They introduce new mixing problems. Among the many variables that must be considered are: time, temperature control, sequence of additions, homogeneity, consistency satisfaction for high-speed extrusion, flow characteristics as related to concentricity of coating and die-flux interface friction as it affects drying. Superimposed upon these are problems of handling at high speed to avoid bruise marks and drying to develop the performance characteristics called for in the specification. Nothing could look simpler than a welding electrode, and yet electrode design and production are complex almost beyond comprehension.

you wouldn't use a steam shovel to dig for bait...



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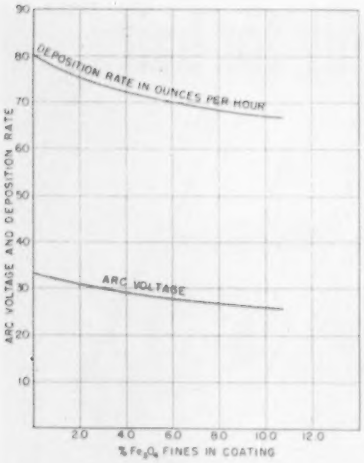
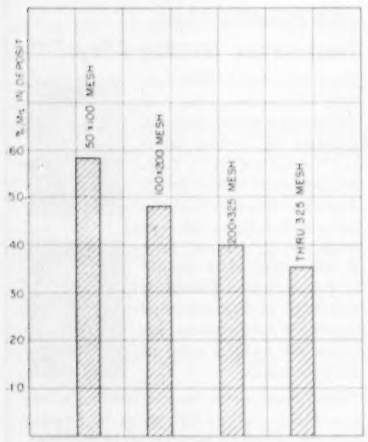


1—HOW binder migration affects deposition rate and arc energy of ¼-in. E-6020 electrode at 325 amp



2—AS particle size increases, so does transfer efficiency; ¼-in. E-6020 electrode was at 325 amp

Purity of Materials

Quality of materials that make up a coating plays an important part in the excellence of performance of an electrode. Purity of an ingredient is not necessarily an indispensable condition, providing that the material is uniform in its composition and low in constituents that are capable of exerting harmful influences. Small amounts of compounds of silicon, aluminum, calcium, magnesium, iron, sodium and potassium are seldom objectionable, for these are generally employed to serve in one function or another in most types of coatings. Compounds of sulphur and phosphorus are among the few elements that are definitely detrimental, and their content must be held to the lowest possible value consistent with cost.

Under the heading of physical formulation, emphasis was placed on the physical characteristics of coating materials and particularly upon particle size. Every coating function is directly or indirectly influenced by size variations. Coarse materials must be rugged enough to withstand normal handling and processing without undergoing appreciable reduction in size. They must have a low degree of reactivity when in combination with soluble silicates; otherwise the ability of the binder to serve its intended purpose may be seriously impaired.

Minerals make up the major portion of the materials used for coatings. Manufactured items such as titanium dioxide, alkali salts, titanates, reduced manganese oxide and ferro-alloys are used in appreciable amounts.

Ferro-alloys constitute a substantial percentage of the materials used in electrode coatings. Most of the materials in this category are employed as deoxidizers. However, the growing use of low-alloy electrodes for welding special steels is increasing the demand for ferro-alloys to impart specific properties to the deposit. An electrode with low-carbon, rimmed-steel core wire and alloys introduced from the coating gives performance and flexibility in design that is not obtainable with an alloy-steel core wire and no alloys in the coating.

Carbohydrates, which are used for arc shielding in conventional electrodes, consist almost entirely of high-grade cellulose that has been processed to remove resins and lignins. Other organic materials such as sugars, wood flour and starches are employed in small quantities.

The soluble silicates of sodium and potassium constitute the major portion of the binders for both conventional and low-hydrogen electrodes at the present time. To reduce the moisture pick-up inherent with silicate-bonded coatings, a ceramic binder has been recently developed for low-hydrogen electrodes.

Minor quantities of other items too numerous to mention are employed for special purposes. In all, upwards of several hundred coating materials find use in the wide variety of electrodes available to the welding industry.

Acknowledgment is made to the Foote Mineral Co. for assistance in the preparation of the illustrations.

OLD KET GETS ON FIRE

(Continued from page 61)

like Ket had and then goes over to his locker and gets some white rod and a small jar of flux. Believe it or not, he welds up that bracket like he had been born with a torch in his hand.

Old Ket looked at the part, cooled it and gave it a yank. He tried to pull it apart like the super had done, but no soap. He hauled off and smacked it against the slab; still no soap. Finally he took a big ball-peen hammer and pounded it, but it would not break.

More Than One Light Metal

Old Ket scratched his ear, rubbed his eyes and then started to mutter, "Well, I'll be an S.O.B., I'll be an S.O.B." Finally, the super took pity on him and told him that the bracket wasn't aluminum, as Ket had thought, but magnesium.

He showed Ket how to tell the difference between magnesium and aluminum. All you need to do is put some filings on a piece of paper and ignite them. If the particles flare up like a firecracker without the fuse, the metal is magnesium, all right. It melts at almost the same temperature as aluminum, but continued overheating of small particles will make them burn. Then you get what Ket did.

All the apprentice did was to use a magnesium rod to make the repair. The reason they threw the magnesium brackets away was because they didn't have inert-gas equipment in that shop and many times gas welding with flux makes the magnesium "bloom" with regular "flowers." The "blooming" is caused by flux entrapment. Sometimes even a good caustic dip will not stop it entirely.

Alas, poor Kettlehead! Don't ever ask him what those red spots on his belly are.

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2S-O 3S-O	A B C 4 1 1	A B C 3 1 1	A B C 4 1 1	A B C 3 1 1	A B C 4 1 1	A B C 3 1 1	A B C 4 2 1	A B C 3 2 1						A B C 4 2 1	A B C 3 2 1	A B C 3 2 1		
2S-H12-H14-H16-H18 3S-H12-H14-H16-H18	A B C 3 1 1	A B C 1 1 1	A B C 3 2 1	A B C 1 1 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1						A B C 4 2 1	A B C 1 2 1	A B C 1 1 1		
4S-O	A B C 4 1 1	A B C 3 2 1	A B C 4 1 1	A B C 3 1 1	A B C 4 2 1	A B C 3 2 1	A B C 4 2 1	A B C 3 2 1		A B C 3 2 1					A B C 3 2 1	A B C 3 2 1		
4S-H32-H34-H36-H38	A B C 3 1 1	A B C 1 1 1	A B C 3 1 1	A B C 1 1 1	A B C 3 2 1	A B C 1 2 1	A B C 4 2 1	A B C 1 2 1		A B C 1 2 1					A B C 1 2 1	A B C 1 2 1		
50S-O	A B C 4 1 1	A B C 3 1 1	A B C 4 2 1	A B C 3 2 1	A B C 4 2 1	A B C 3 2 1	A B C 4 2 1	A B C 3 2 1							A B C 3 2 1	A B C 3 2 1		
50S-H32-H34-H36-H38	A B C 3 1 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1		A B C 1 2 1					A B C 1 2 1	A B C 1 2 1		
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52S-H32-H34-H36-H38	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1		A B C 1 2 1	A B C 2 2 2	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1	A B C 1 2 1	A B C 1 2 1	A B C 2 2 2	A B C 2 2 1
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14S-T4-T6								A B C 2 2 2			A B C 2 2 2	A B C 2 2 1	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2
ALCLAD 14S-T4-T6 HARDCLAD R301-T3-T4-T6								A B C 2 2 1			A B C 2 2 1	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1	A B C 2 2 1	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1
24S-T3-T4								A B C 2 2 2			A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2
ALCLAD 24S-T3-T4	A B C 4 2 1	A B C 4 2 1						A B C 2 2 1			A B C 2 2 2	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1	A B C 2 2 1	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1
61S-T4-T6	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 2 2 2	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1	A B C 2 2 1	A B C 1 2 1	A B C 2 2 2	A B C 2 2 1
63S-T5-T6	A B C 3 2 1	A B C 1 1 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 3 2 1	A B C 1 2 1	A B C 2 2 2	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1	A B C 1 2 1	A B C 1 2 1	A B C 2 2 2	A B C 2 2 1
75S-T6								A B C 2 2 2			A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2	A B C 2 2 2
ALCLAD 75S-T6								A B C 2 2 1			A B C 2 2 2	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1	A B C 2 2 1	A B C 2 2 1	A B C 2 2 2	A B C 2 2 1

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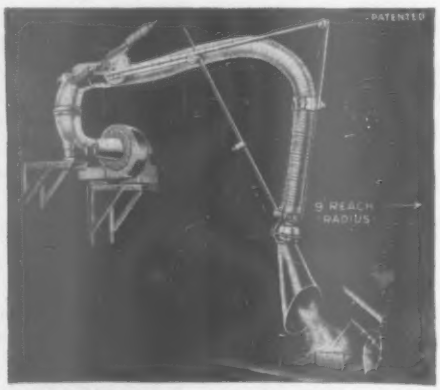

(Right) Welding with Ruemelin Fume Collector.

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CLEVELAND: OCT. 19-23

(Continued from page 45)

ident, Arizona Welding Equipment Co., Phoenix; C. P. Sander, general superintendent, Consolidated Western Steel Co., Los Angeles, and J. W. Mortimer, engineer, Whitlock Mfg. Co., Elmwood, Conn.

New district vice-presidents are:

No. 1 (New York and New England), C. E. Jackson, Union Carbide & Carbon Research Laboratories, Niagara Falls, N.Y.; No. 3 (Southern), A. E. Pearson, Ingalls Iron Works, Birmingham, Ala.; No. 5 (Midwestern), J. B. Welch, Cutler-Hammer, Inc., Milwaukee; No. 7 (Western), C. M. Styer, Pacific Car & Foundry Co., Seattle, Wash.

Technical Sessions

The technical sessions will be held on Monday afternoon, Tuesday morning and afternoon, Wednesday morning and afternoon, Thursday morning and Friday morning. Except for the board of directors' meeting and annual business meeting, the Thursday afternoon period is left vacant for visits to the 35th National Metals Exposition at the nearby Public Auditorium (see page 55).

The 19 sessions can be divided about equally among the three broad categories of processes, materials and applications.

Process sessions include one on gouging and cutting, two sessions on inert-gas welding, a session on automatic welding and a single session on resistance welding. Last year there were three sessions on resistance welding, so the emphasis appears to have changed somewhat.

Of the materials sessions, titanium will account for two full sessions and six papers, evidence of the continued popularity of this "new" metal among researchers. There will be a session on aluminum, a session on stainless steel, two sessions on weldability and one session on research into special aspects of nodular cast iron, mild steel and chrome-moly steels.

Applications sessions include one structural session, one session on field-erected structures (ships and bridges), a session on pipe, a session on pressure vessels and a catch-all session that will hold such diverse topics as welding shop facilities, silver and gold for brazing electronic components, tool and die welding,

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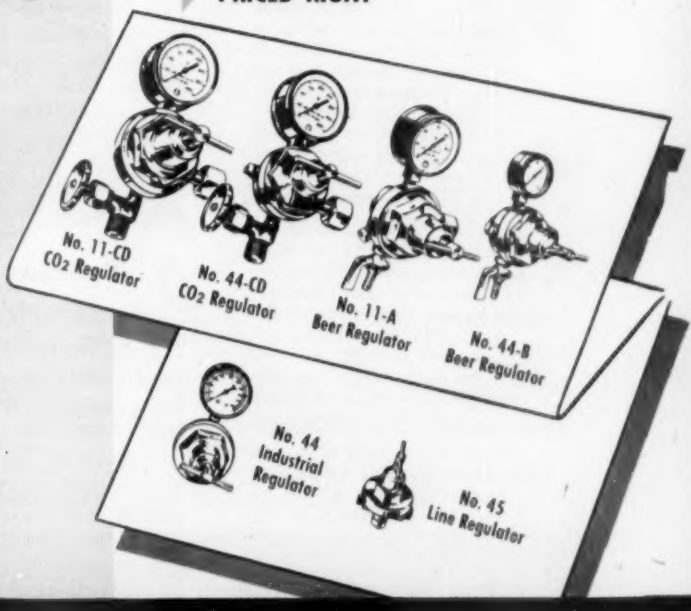

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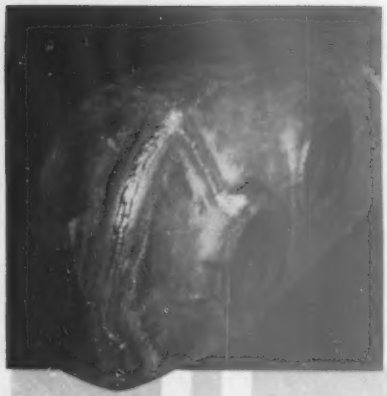

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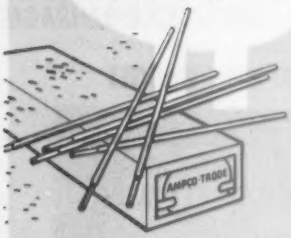

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The remaining two technical sessions don't fit into the three broad categories just outlined. One of these sessions will be on education; the other on controls and inspection. The tentative technical program is as follows:

Monday Afternoon

A—GOUGING AND CUTTING

Richard L. Deily, Air Reduction Sales Co., chairman; R. S. Babcock, Linde Air Products Co., co-chairmen.

1. THE ARCAIR PROCESS, by Myron D. Stepath, Arcair Co.

2. SHIELDED METAL-ARC CUTTING AND GROOVING, by Helmut Thielsch and J. Quaas, Eutectic Welding Alloys Corp.

3. ADVANCED AUTOMATIC FLAME-CUTTING FOR MACHINERY WELDMENTS, by Howard B. Cary, Marion Power Shovel Co.

B—RESISTANCE WELDING

R. E. Powell, Western Electric Co., chairman; John Diebold, Diebold Engineering Sales Co., co-chairman.

1. RADIOGRAPHY OF SPOT WELDS, by Robert C. McMaster, Battelle Memorial Institute.

2. RESISTANCE WELDING IN JET ENGINE MANUFACTURING, by Frank J. Wallace, Pratt and Whitney Aircraft Div. of UAC.

3. A STUDY OF THE COOLING RATES IN FLASH WELDS IN STEEL, by Ernest F. Nippes, Warren F. Savage and Gordon Grotke, Rensselaer Polytechnic Institute.

4. APPLICATIONS OF HIGH-SPEED MOTION PICTURE PHOTOGRAPHY TO RESISTANCE WELDING, by I. S. Goodman, Westinghouse Electric Corp.

Tuesday Morning

A—STAINLESS STEEL

F. W. Davis, U. S. Atomic Energy Commission, chairman; V. N. Krivobok, The International Nickel Co., Inc., co-chairman.

1. EFFECTS OF VARIOUS HEAT TREATMENTS ON MODIFIED 347 WELD DEPOSITS, by R. D. Thomas, Jr., and Lorin K. Poole, Arcos Corp.

2. SILVER-BRAZING ALLOYS FOR CORROSION-RESISTANT JOINTS IN STAINLESS STEELS, by George H. Sistare, Handy & Harman; L. H. Grenell,

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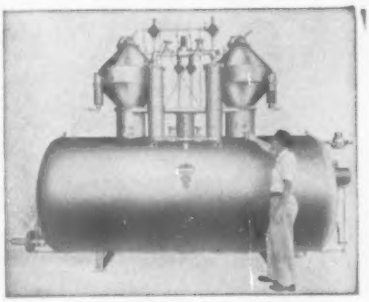

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General Motors, and John J. Halbig, Armco Steel Corp.

3. Submerged-Arc Welding of Chromium-Bearing Steels, by Clarence E. Jackson and Arthur E. Shrubsall, Union Carbide & Carbon Laboratories.

B—TITANIUM

F. R. Hensel, P. R. Mallory & Co., chairman; G. Grable, Battelle Memorial Institute, co-chairman.

1. Tension, Shear and Impact Strengths of Spot-Welded Titanium Joints, by M. L. Begeman, E. H. Block, Jr., and Frank W. McBee, Jr., University of Texas.

2. Fusion Welding Commercially Pure Titanium, by Francis H. Stevenson, Aerojet General Corp.

3. Alloy Filler Metals in Commercially Pure Titanium, by Carl E. Hartbower, Watertown Arsenal Laboratory.

C—STRUCTURAL

Bruce G. Johnston, University of Michigan, chairman; Ross Yarrow, Consolidated Iron & Steel Co., co-chairman.

1. Residual Stress and Inelastic Bending of WF Columns, by Robert L. Ketter, Lynn S. Beedle, Lehigh University, and E. L. Kaminsky, David Taylor Model Basin.

2. Weldability of Structural Steel from the Viewpoint of Federal Agencies, by E. L. Erickson, chief, Bridge Branch, Bureau of Public Roads.

3. Development of Welded Bridge Construction, by N. W. Morgan, principal highway bridge engineer, Bureau of Public Roads.

4. Recent Applications of Welded Design to Industrial Building Framings, by A. Amirikian and E. G. Odley, Bureau of Yards and Docks, Navy Department.

Tuesday Afternoon

A—ALUMINUM AND AIRCRAFT

R. S. Green, Ohio State University, chairman; Charles Bruno, Reynolds Metals Co., co-chairman.

1. Soldering of Aluminum, by James D. Dowd, Aluminum Co. of America.

2. Fatigue Strength of Welded Butt Joints in 3/8-in. Thick Aluminum-Alloy Plates, by E. C. Hartmann, Marshall Holt and I. D. Eaton, Aluminum Co. of America.

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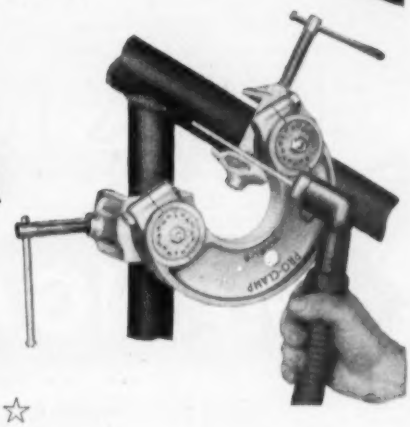

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3. Weldability of Aluminum Alloys, by J. Koziarski, Piasecki Helicopter Corp.

B—WELDABILITY

R. E. Somers, Bethlehem Steel Co., chairman; J. Robert Henry, Cleveland Diesel Div., General Motors Corp., co-chairman.

1. Cracking in High-Temperature Alloys as Related to Microstructure, by W. R. Apblett and W. S. Pellini, Naval Research Laboratory.

2. Ductility Transition Characteristics of Weld Metal, by Earl Eschbacher and W. S. Pellini, Naval Research Laboratory.

3. Further Studies on Weld-Metal Microcracking in Mild Steel, by A. E. Flanigan, University of California.

Wednesday Morning

A—WELDABILITY

L. C. Bibber, United States Steel Corp., chairman; G. E. Claussen, Union Carbide & Carbon Research Laboratories, Inc., co-chairman.

1. Army First-Pass Groove-Weld Crack-Susceptibility Test, by Z. J. Fabrykowski, S. Goodman and B. A. Schevo, Detroit Arsenal.

2. Low-Temperature Bend-Test Properties of Bead-on-Plate Welds, by L. A. Harris, R. B. Matthiesen and N. M. Newmark, University of Illinois.

3. Fatigue Properties of Weld Metal, by L. A. Harris, R. B. Matthiesen and N. M. Newmark, University of Illinois.

B—TITANIUM

Col. B. S. Mesiok, Ordnance Corps, Watertown Arsenal, chairman; W. L. Warner, Watertown Arsenal, co-chairman.

1. A Study of Weld Heat-Affected Zones in Titanium Alloys, by Ernest F. Nippes, John M. Gerken and Bernard W. Schaaf, Rensselaer Polytechnic Institute.

2. Welding Characteristics of Titanium and Titanium Alloys, by Mario L. Ochieano, Lockheed Aircraft Corp.

3. Effects of Alloying Elements on the Weldability of Titanium Sheet, by Dr. Max Hansen, Armour Research Foundation.

C—CONTROLS AND INSPECTION

Gilbert S. Schaller, University of Washington, chairman; R. J. Kriz, The James B. Herron Co., co-chairman.

1. Inspection Techniques for Quality Welding Production, by Lew Gilbert, *Industry and Welding*, and William B. Bunn, The M. W. Kellogg Co.

2. Non-Destructive Testing as an Aid to Increased Use of Welding for Steel Structures, by Lloyd J. Oye, Magnaflux Corp.

3. Tolerances on Fillet Welds, by John Mikulak, and Merle B. Dillman, Worthington Corp.

Wednesday Afternoon

A—PIPE

A. J. Erlacher, United Engineers & Constructors, Inc., chairman; N. C. Jessen, Babcock & Wilcox, co-chairman.

1. Further Studies of the Arc Welding of Low-Chromium Molybdenum Steel Pipe, by J. Bland, Standard Oil Co. (Ind.).

2. Superheaters for 1,100 F to 1,500 F Test Installation, by Bela Ronay and W. E. Clautice, U.S. Naval Engineering Experiment Station.

3. Carbide Segregation and Decarburization at Welded Joints, by I. A. Rohrig, Detroit Edison Co., and H. S. Blumberg, M. W. Kellogg Co.

B—RESEARCH

G. E. Doan, Koppers Co., Inc., chairman; Frank Flocke, The Thornton Co., co-chairman.

1. Welding Metallurgy of Nodular Cast Iron, by Edward Hucke, and Prof. H. Udin, Massachusetts Institute of Technology.

2. Effect of Low-Temperature Stress Relieving on Stress-Corrosion Cracking of Mild Steel, by C. R. McKinsey, Union Carbide and Carbon Research Laboratories, Inc.

3. Transformation of Cr-Mo Steels during Welding, by W. R. Apblett, Jr., R. P. Dunphy and W. S. Pellini, Naval Research Laboratory.

4. Multiple Contact Resistance, by W. B. Kouwenhoven and Donald R. Hagner, The Johns Hopkins University.

C—EDUCATION

Dean A. Potter, Purdue University, chairman; Prof. M. L. Begeman,

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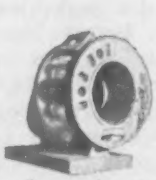

Low-alloy casting, typical of applications where physical properties must be matched.

Alloy gear rim, typical application matching heat-treating properties of parent metal.

Excavator body, typical of heavy sections welded with P&H Low-Hydrogen Electrodes.

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University of Texas, co-chairman.

1. Teaching Engineering Fundamentals, by Dean S. C. Hollister, Cornell University.

Discussion: Dean W. B. Kouwenhoven, The Johns Hopkins University, and Prof. R. S. Green, Ohio State University.

2. Teaching Welding Design, by Dr. J. P. Vidosic.

Thursday Morning

A—PRESSURE VESSELS

T. N. Armstrong, The International Nickel Co., Inc., chairman; L. J. Larson, Allis-Chalmers Mfg. Co., co-chairman.

1. Plastic Fatigue Strength of Pressure Vessel Steels, by Robert D. Stout, John H. Gross and D. E. Gucer, Lehigh University.

2. Qualitative Study of Residual Stresses in Welds by Photoelasticity, by Dr. Melvin Mark, Raytheon Mfg. Co.

3. Effect of Nitrogen and Carbon Dioxide Atmospheres on Arc Welding, by Profs. Sowa, Truckenmiller and Wagner, University of Michigan.

4. Biaxial Fatigue Properties of Pressure-Vessel Steels, by T. J. Dolan and C. E. Bowman, University of Illinois.

B—INERT-GAS WELDING

C. I. MacGuffie, General Electric Co., chairman; H. E. Rockefeller, Linde Air Products Co., co-chairman.

1. Inert-Gas-Shielded Metal-Arc Welding of Low-Carbon Steels, by George C. Christopher and R. C. Becker, International Harvester.

2. Characteristics of Consumable-Electrode Inert Arcs, by R. W. Tuthill, General Electric Co.

3. Effect of Power-Supply Characteristics on Sigma Welding, by W. H. Helmbrecht and R. L. Hackman, Linde Air Products Co.

4. Weld Properties of a Carbon-Steel Electrode for use with Inert-Gas Shields, by Harry C. Cook and Gilbert R. Rothschild, Air Reduction Research Laboratories.

C—AUTOMATIC ARC

C. C. Peck, of Cecil C. Peck Co., chairman; L. S. McPhee, Whiting Corp., co-chairman.

1. New Developments in Fluxes for Automatic Welding and Hardfacing, by L. K. Stringham, The Lincoln Electric Co.

2. Multiple-Electrode Welding by the Submerged-Arc Process, by D. E. Knight, Linde Air Products Co.

3. Multiple-Arc Submerged-Arc Welding, by Theodore Ashton, Lincoln Electric Co.

Friday Morning

A—APPLICATIONS

C. B. Herrick, C. B. Herrick Co., chairman.

1. New Welding Shop Facilities, Methods and Equipment at the Whiting Refinery, by Ray M. Kolb and R. C. Wheeler, Standard Oil Co. (Ind.).

2. Silver and Gold for Brazing Electronic Components, by A. W. Swift and R. J. Metzler, Handy & Harman.

3. New Results in Tool and Die Welding, by Robert H. Gorman, Eutectic Welding Alloys Corp.

4. Austenitic Manganese Steel Welding Electrodes, by Howard S. Avery and Henry J. Chapin, American Brake Shoe Co.

B—INERT-GAS WELDING

R. M. Wilson, International Nickel Co., Inc., chairman; A. R. Lytle, Electro Metallurgical Co., co-chairman.

1. New Method to Prevent Rectification of Current and High-Frequency Interference in Inert-Gas Arc Welding, by John Murray, The Lincoln Electric Co.

2. New Developments in Sigma Welding of Carbon Steel, by T. McElrath, Jr., and R. T. Telford, Linde Air Products Co.

3. Porosity in the Welding of Carbon Steel, by Glenn W. Oyler and Robert D. Stout, Lehigh University.

C—FIELD-ERECTED STRUCTURES

E. MacCutcheon, Bureau of Ships, U. S. Navy, chairman; L. C. McNutt, United Engineers & Constructors, Inc., co-chairman.

1. Scale Effects in Notch Brittleness, by Yoshio Akita, Transportation Technical Research Institute.

2. Effect of Subcritical Heat Treatment on the Transition Temperature of a Ship-Plate Steel, by E. B. Evans and L. J. Klingler, Case Institute of Technology.

3. Welded Mexican Bridge, by Thomas C. Kavanagh, New York University.

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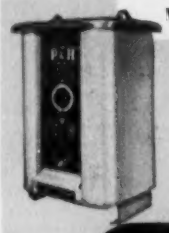

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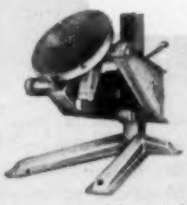

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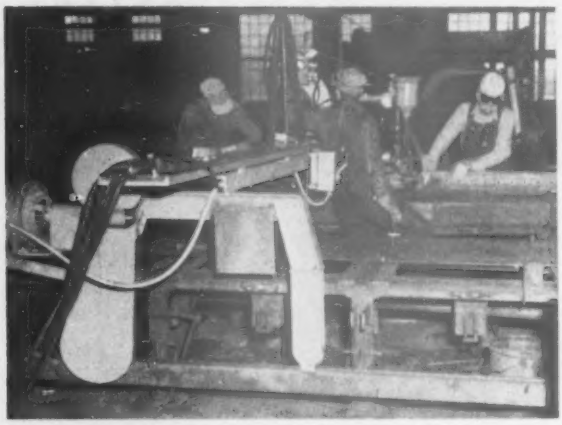

A-FRAME carriage is about to weld floor angles to a web plate. Note cross-travel of submerged-arc head

CONTROLS look down on their spot welders in the resistance-welding section of new Cutler-Hammer plant

A-Frame Rates an "A"

ENGINEERS of the Chicago & Eastern Railroad and the Oxweld Railroad Service Co. worked together at the railroad's shops at Danville, Ill., to lick a tough one. The job was to weld angles to web plates in the fabrication of the two side sills and two center sills of a 70-ton "fish-belly" flat car by submerged-arc welding. Since the bottom contour of the sills changes directions four times, a mechanized welding uit was required that could move longitudinally and diagonally at the same time.

The solution was a specially designed A-frame carriage (see top, left photo), equipped with a 1-hp, 1,750-rpm d-c motor. The carriage is 4 ft high, straddles the work in gantry fashion and rides on two 60-ft-long rails. Travel speed may be varied from 20 to 48 ipm by means of a series of rheostats. Shaft connections to a drive wheel on both sides of the gantry propel it along the main rails. A clutch permits the drive to be disengaged to allow the carriage to be pushed manually.

The welding head travels on two other rails that are mounted atop and at right angles to the traveling A-frame. Since both movements can take place at the same time, it is possible to follow any desired contour of a two-dimensional surface.

Fabrication of the side sill is begun by welding a 6 by 4 by 3/4 in. angle to the top length of a 3/8-in. web plate 52 ft long. The A-frame is moved over the assembly to make a 5/16-in. fillet weld. Since this weld is perfectly straight, only the A-frame is set in motion. The carriage riding crosswise on the frame is locked into place, and the welding head is cocked at a 45-deg angle. Welding speed for the operation is 24 ipm at 780 amp d-c reverse polarity. A 3/16-in. steel welding wire is used.

It is in the next operation that the A-frame set-up proves its versatility. Five lengths of angle are clamped to the bottom of the web plate to follow the fish-belly contour. The changing contour is easily followed with the welding head by "toeing in" the guide wheel. The guide wheel is set to toe in about ¼ in. to follow the contour of the angles. As the weld angle changes, the guide wheel automatically adjusts the direction of welding. There is no loss in welding speed.

In the next operation, the web plate is flopped over to expose the other unwelded surface. Since it is now resting on the 4-in.-high angles that were welded earlier, the welding head must be raised to the new level. This is done by means of telescoping tubing. Seventeen sections of 6 by 4 by ½ in. floor angles are clamped in place along the top length of the web plates. These angles are spaced about 5 in. apart. Spacer plates are placed between them to permit uninterrupted welding. The ¼-in. fillet weld is made at a speed of 30 ipm. Approximately 154 ft of welding are required for each side sill.

Construction of the two center sills requires only a slight variation. Each center sill has two sets of directly opposing angles, which follow the contour of the fish-belly bottom, one on either side of the web plate. This necessitates two contour-welding operations instead of the single one required on the side sills. A one-piece floor angle is welded to the top of the center sill, running the length of the sill. Dimensions and welding specifications are the same as those of the side sills.

Clean, smooth welds join the angles to the web plates. Altogether, the A-frame solution to this welding problem rates an "A".

* * *

Balcony Controls

SPOT and projection welding at the new 30th Street plant of Cutler-Hammer, Inc., Milwaukee, is controlled entirely from the balcony (top right photo). The electronic controls for the welders are mounted on a specially arranged balcony above the main floor, while there is a power substation in the basement directly underneath the welders. This arrangement keeps cable runs to the various units at a minimum, holds down power loss, keeps the main floor area relatively open and permits a considerable flexibility in arranging the welders on the floor.

There are 12 spot welders (used also for projection welding) and three portable welding guns. Machine capacities range from 20 kva to 200 kva. The items manufactured include enclosing cases and covers for electrical control equipment, panels, mounting plates and various switch and contactor parts. Most of the material welded is mild steel, ranging from 18 gage to ¼ in. thick.

4 FEATURES THAT MAKE

STOODY 21

FIRST FOR ECONOMICAL WEAR PROTECTION!

FAST DEPOSIT RATES

HIGH ALLOY CONTENT

EXCELLENT ABRASION RESISTANCE

LOW COST

STOODY 21 is an excellent AC-DC electrode for manual hard-facing where severe wear is involved. Deposits are smooth and dense. Bonds with plain carbon and alloy steels, including manganese. Wide amperage latitude.

COATED RODS weld without slag interference and slag removes easily. Good for position welding at lowered amperages.

BARE RODS make heavy layers in one pass with exceptionally fast deposition rate. Recommended for flat position work.

Ask your dealer for details (see the yellow pages of your phone book) or write direct.

STOODY COMPANY

11941 East Slauson Avenue, Whittier, California

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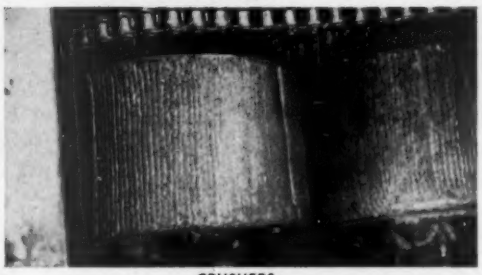
POWER SHOVEL BUCKETS



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TYPICAL APPLICATIONS

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New Products . . .

INTERCHANGEABLE cases and most parts are featured on Westinghouse 200, 300 and 400 amp rectifier welders

REDESIGNED engine-driven welders by Hobart have air-cooled engines. Smaller welder is alone in its class

New D-C Welder

REDUCTIONS in size and weight with added ease of maintenance are the principal advantages of a new Westinghouse selenium-rectifier d-c arc welder.

As shown above, 200, 300 and 400 amp welders all have the same size case, with identical bases, covers, cooling fans, motors, mechanical parts and core punchings. This standardization of parts makes maintenance stocking of spare parts much simpler.

Heart of the new welder is a three-phase full-wave selenium rectifier, of course, but the new "Transactor" unit deserves attention. It is a combination three-phase transformer and movable core reactor. Having aluminum coils (the first in any welder), the "Transactor" permits current control by a hand crank on the welder case. The crank moves the movable core section in relation to the aluminum coils.

Overload protection guards the new welders from damage. When the welder is overloaded from operating at an excessive duty cycle or without the ventilating fan, a heat-sensitive mechanism in one of the coils goes into operation. It activates a shunt-trip that in turn causes a three-pole circuit breaker to open, taking the welder off the line.

Efficiency curves and power factor considerations are said to be considerably higher than with motor-generator d-c welders.

WESTINGHOUSE ELECTRIC CORP., Box 2278, Pittsburgh 30.

Hot Materials Mitt

THREE layers of cloth feature the "Kool-Mitt", designed for handling hot metals or other materials. An asbestos layer protects the leather layer and gives fireproof protection. A wool layer in addition to the other two provides maximum insulation. The mitt is stitched with steel staples. The back of the mitt is open for ventilation.

SINGER GLOVE MFG. CO., 360 W. Weed St., Chicago 22.

* * *

Triple Scaler

THE new Thor No. 326 Triple Scaler will clean rust, paint and scale from boilers, tanks and structural steel. It has three piston-type units which operate with a rotary motion to do three times the work of Thor's No. 26 scaling tool. It weighs 7½ lb.

THOR POWER TOOL CO., Aurora, Ill.

New Hobart Welders

TWO new air-cooled engine-driven welders made by Hobart will be seen at the Metal Show. One is a 200-amp a-c arc welder and 5-kw a-c power unit. By flipping a single switch, either welder or 110 volt lighting current can be obtained. The latter current supply is sufficient to run 50 lamps or floodlights of 100-watt capacity. Engine is a Wisconsin 4-cylinder air-cooled engine.

The other welder is lower in cost and is powered by a 2-cylinder Wisconsin air-cooled engine. Rated at 200-amp it measures only 38-in. long, 21¼-in. wide and 35 5/16 in. high.

HOBART BROTHERS CO., Hobart Square, Troy, O.

* * *

Aluminum Bonding

FABRICATION of aluminum products is said to be very simplified with the use of a new "Aluminum Bonding Metal". No flux or special preparation of the parent metal is required, but the strength of the resulting joint is said to run from 20,000 to 45,000 psi for shear and tensile values.

"Aluminum Bonding Metal" is manufactured in melt temperatures ranging between 425 F and 825 F.

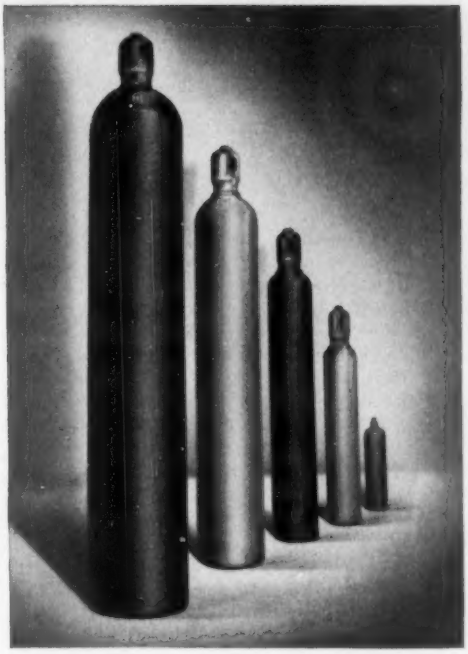
To join the parts, the parent metal is heated to the melt point of the bonding metal and then the two are brought together. There are said to be no corrosive characteristics in this type of bonding.

PAUL E. REIMULLER, Glendora, Calif.

HARRISBURG CYLINDERS

FOR HIGH-PRESSURE GASES

1853 ★ 1953
HARRISBURG STEEL
Centennial Year
100 YEARS OF SERVICE TO COUNTRY AND INDUSTRY



Go to cylinder specialists for quality oxygen gas cylinders

It stands to reason: there is no substitute for experience. *Harrisburg Steel* is the pioneer and world's largest manufacturer of high-pressure gas cylinders made to I. C. C. specifications. And for decades, *Harrisburg Steel* has built reliable cylinders for all branches of the Welding industry . . . cylinders possessing extra margins of *quality* and *safety* . . . cylinders that perform better and last longer. Capacities range from 14 to 400 cubic feet . . . they are manufactured in both domestic and export types. The next time you order high-pressure gas cylinders, may we suggest that you entrust your order to *Harrisburg Steel*. Meanwhile, use the handy coupon on this page to obtain a catalog and current prices.

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CITY ..... ZONE ..... STATE .....

Canvas-Band Clamp

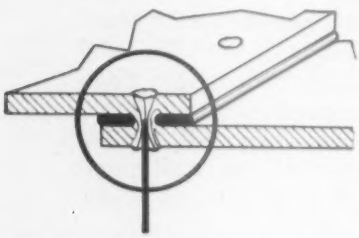
MANY otherwise difficult clamping procedures will be made easier with the Style No. 62 "Jorgensen" band clamp. It will hold or clamp such irregularly shaped objects as aircraft assemblies (pictured above), tanks and columns, furniture frames, for welding, riveting or gluing.

The strong canvas band is 2-in. wide and encircles the object to be clamped. It is drawn tight by the screw-fixture. A steel band is optional with the clamp, but can be used only on round shapes.

Complete clamp and band weigh only about 6 lb. The canvas band is supplied unless the steel one is specified. Stock sizes are from 10 to 30-ft band length capacity.

ADJUSTABLE CLAMP CO., 426 No. Ashland Ave., Chicago 22.

* * *

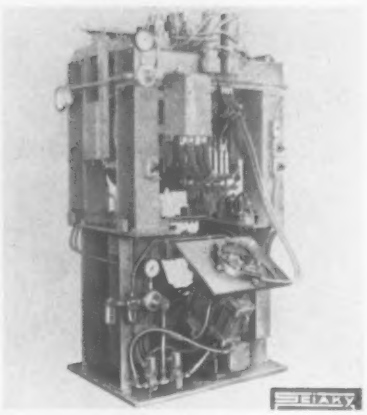


Spot Weld Sealer

"WELDSEAL" tape protects spot-welded and hot riveted assemblies from corrosion by sealing the seams against moisture. It is applied between the sheets of metal prior to welding. It forms a tight gasket the entire length of the seam. It does not burn away from welds but flows around the superheated area and returns to its original plastic character at room temperature. Being mildly conductive, the tape can be used without changing settings on the welder.

It comes in two thicknesses, 0.015 and 0.025 in. and in any width from ½ in. to 12 in.

PITTSBURGH PLATE GLASS CO., 420 Ft. Duquesne Blvd., Pittsburgh 22.



New Sciaky Welder

TWO individual operating platens are featured on the new Model SX-36-G multiple electrode resistance welder. The platens are loaded in the extended position, swing in and lift to welding position; after welding, the platen retracts and swings out for unloading.

The 18 by 24 in. platen receives the dies necessary for a specific application and in the extended position is easy to load and unload. Because the platen lifts and retracts from the welding position, a wide variety of deep-drawn piece parts can be welded.

The two platens can be operated individually in the production or they can operate simultaneously through only the lifting and retracting sequences. With simultaneous operation, in lifting, welding and retracting, long or large piece parts can be passed through the middle of the machine to make large weld patterns in one operation.

The SX-36-G is a Sciaky standard multiple gun base machined with fabricated steel superstructure for the arrangement of welding guns and transformers to the customer's wishes.

Transformers are made in accordance with J.I.C. standards and are rated at 50 kva—each has a four-step tap switch to adjust secondary voltage from 3.2 to 5 volts. Individual welding guns are single acting hydraulic units with spring return. The welding control is supplied as a free standing, floor-mounted unit, and is one of the nonsynchronous type.

SCIAKY BROS., INC., 4915 W. 67th St., Chicago 38.

* * *

Back-Up Flux

NEWEST Eutectic product for stainless steel welding is a flux that protects the root (back side) of the weld while using the inert-gas process. Called Eutector Flux 569-I, it is also useful for welding nickel, Monel, Inconel and the super alloys. When applied to the underside of butt and corner joints, penetration is simplified by the new flux action in controlling the molten weld metal.

Other qualities of the new flux are its anti-oxidizing properties and its easy removability after welding.

EUTECTIC WELDING ALLOYS CORP., 172nd St. & Northern Blvd., Flushing, N.Y.

* * *

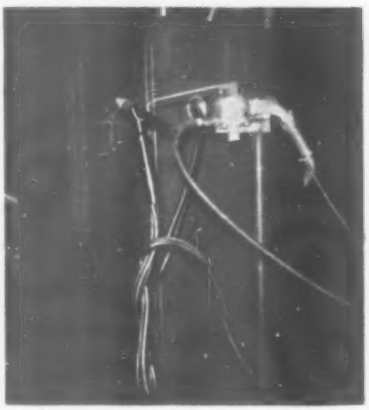
New Tempil Ratings

TEMPILSTIKS, Tempilaq and Tempil pellets for 413 deg, 425 deg, 438 deg, 463 deg, 475 deg and 488 deg F will be displayed and demonstrated at the Metal Show by Tempil Products. The new heat ratings will be of interest to those having to preheat for welding.

A new Tempilaq protective coating will be demonstrated for such applications where the indicator is likely to come in contact with oil, water or grease. The new coating is applied over the Tempilaq layer after the latter is thoroughly dry. The transparent film developed in this manner will function satisfactorily up to 400 F, is impervious to oil, water and grease and will permit the melting of the Tempilaq to be clearly visible.

TEMPIL CORP., 11 West 25th St., New York City 10.

* * *



Inert-Gas Control

A NEW mechanical, time-delay control valve provides a flow of shielding gas through an inert-gas welding torch after welding has been completed. Named the "No. 1155 control", the new valve utilizes an adjustable bleed-off principle. After the desired time, the valve cuts off the gas flow.

F. BRIGGS AND B. HORAN MANUFACTURERS REPRESENTATIVES, 1015 E. 75th St., Chicago 19.

over 1,000
SPECIALIZED WELDING GUNS FROM ONE PROGRESSIVE STANDARDIZED MODEL

PROGRESSIVE'S EXCLUSIVE NYLON GUIDE

- Constant guide and support throughout stroke
- Self-insulating
- Resists weld spatter
- No lubrication required

Both Progressive guns in the above illustration have the same chassis—the difference is in the interchangeable cylinders, jaw extensions, electrode adapters, and tips.

Using Progressive's original Standardized Chassis and interchangeable parts, job-specialized portable welding guns can be made for a fraction of the cost of specially-designed guns.

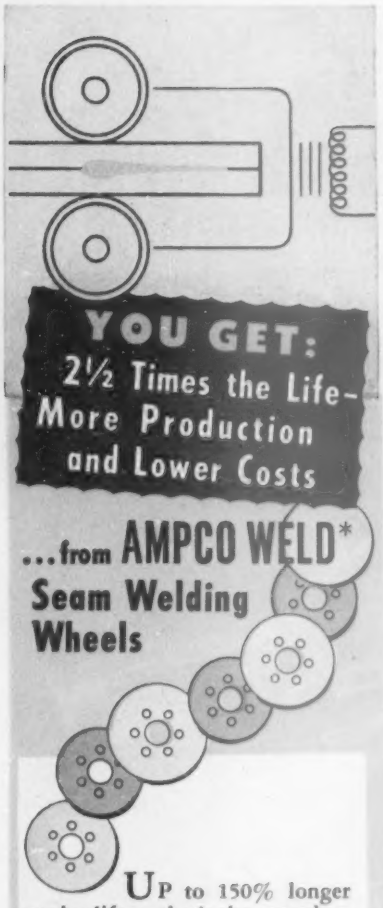
Progressive has more portable guns in use than all other manufacturers combined. For information on any type of Special or Standard Portable Gun—write to Progressive in care of Department G.

SPATS TO WELD

The PROGRESSIVE Welder Sales Company

3070 E. OUTER DRIVE • DETROIT 34, MICHIGAN

Group of special jaw designs demonstrating wide versatility of Progressive Welding Guns.



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2½ Times the Life-
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and Lower Costs

...from AMPCO WELD*
Seam Welding
Wheels

UP to 150% longer service life — that's the record reported by users of Ampco Weld tube and seam welding wheels. And here's why: Ampco Weld wheels have unusual hardness and toughness at elevated temperatures — exceptional resistance to wear — extra durability. And they also have uniformly high electrical conductivity. All this adds up to longer runs, fewer shutdowns, increased production, lower costs.

You can order Ampco Weld wheels as rough forgings, finished blanks, or fully machined, as you prefer.

Ampco Weld wheels are part of an extensive line of Ampco resistance-welding products. All meet or exceed RWMA specifications. And Ampco offers you free, expert engineering service for specialized applications, if you want it. Order Ampco Weld wheels today — watch production step up, costs step down.

AMPCO Ampco Metal, Inc.
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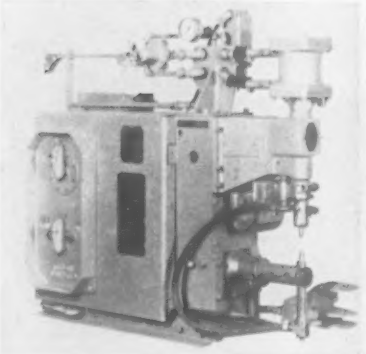
West Coast Plant: Burbank, California

*Reg. U. S. Pat. Off. RW-7



Spot Welder

A COMPACT new spot welder, the EB-3, can be placed on a bench or in a group for production jobs. Air operated, it has a throat depth of 8 in. With 80 psi line pressure a welding force of either 750 lb or 1,000 lb maximum is available. Electrode stroke is 1¾ in. maximum.

The lower horn of the Type EB-3 welder is 2 in. in diameter and vertically adjustable to 4 in. The lower electrode holder (ejector type) is 6 in. long and 1 in. in diameter with a No. 1 Morse Taper. The upper electrode holder (ejector type) is built as a permanent part of the upper terminal.

While many possible combinations of controls can be used, the use of synchronous types are recommended where exacting work is being done. A magnetic or electronic contractor, as well as a sequence weld timer is necessary for the Type EB-3 welder.

THE TAYLOR-WINFIELD CORP., Warren, O.

* * *

Brazing Flux

Two advantages are claimed for "Special No. 6" silver solder paste flux: non-toxicity and wide working range (850 to 1,600 F). A complete absence of hydrofluoric acid is claimed so there can be no harmful effect on eyes, nose or lungs. Being alkaline, parts prefluxed can be laid away without corrosion danger.

Flux residues are removed by hot water and brush, with no grinding or chipping necessary. Having low surface tension it permits close tolerances of the parts to be joined.

It is said to be useful for brazing, hard soldering and silver soldering of any ferrous or nonferrous metal or alloy except aluminum and magnesium.

THE SUPERIOR FLUX & MFG. CO., Dept. X-10, 1302 Ontario St., Cleveland 13.

It's the CONNECTION that counts!

cam-lok
cable connectors
proved:

"LOWEST RESISTANCE OF ALL TESTED!"

1 "Connects" easily and tightly
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3 Gives positive contact
4 Insures time and money-saving interchangeability
5 Eliminates arcing and burning

With the same cable, current carrying ability is limited only by the connectors. That's why a noted welding equipment manufacturer tested various makes of connectors. Under a 400 ampere load, the Cam-Lok Connector showed negligible resistance . . . only 10.6 millivolt drop . . . lowest of all connectors tested!

Are connectors the weakest link in your welding lines? Get trouble-free Cam-Lok for the most perfect contact possible. Just two interchangeable sizes connect all cables from No. 1 through 4/0.

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Dependable Westinghouse A-C Welders pay off... this time for Avery and Saul Company

The 40 Westinghouse A-C Welders (from 200 to 1500 ampere capacity) at the Avery and Saul Company, Cambridge, Massachusetts, are on the job 24 hours a day—every day. Their outstanding record—not one single case of out-service for repairs—has contributed to this company's rapid growth as recognized "specialists in steel plate fabrication".

Even the toughest corner weldments are no problem to this production-minded fabricator. Absence of arc blow and ease in using heavier electrodes with higher current insure good welds in all positions—at higher speeds. And since power source is an important factor in their operation, Avery and Saul was quick to recognize a sharp reduction in power costs, too. With the built-in power-factor correction feature on the Westinghouse a-c sets, their demand rates are kept low and they pay only for current actually used.

Westinghouse can help *you*, too—with skilled application engineering and industry's *most* complete arc-welding line.

Call your nearest Westinghouse Welding Distributor, or write Westinghouse Electric Corporation, Welding Division, P. O. Box 868, Pittsburgh 30, Pa. For helpful literature just send in the attached coupon.

J-21816

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EVERYTHING for Welding ANYTHING!

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AN AIR REDUCTION PRODUCT

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Most Specified . . .
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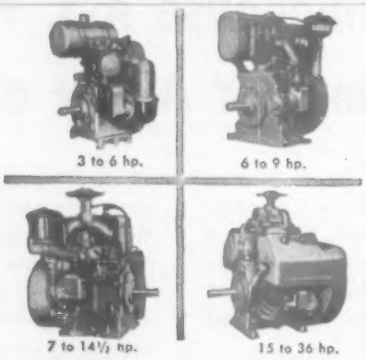
Most H.P. Hours . . .

WISCONSIN
HEAVY-DUTY
Air-Cooled
ENGINES



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Power to Fit the Machine

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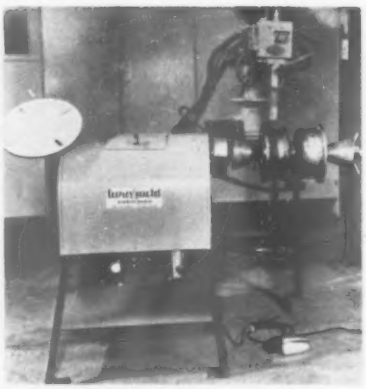
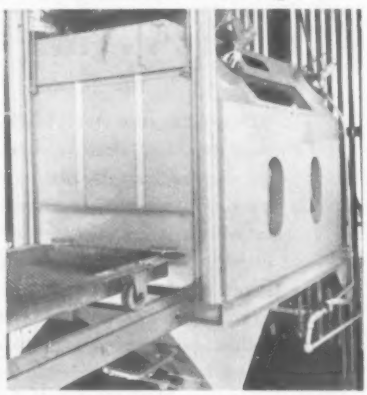


New Positioner

SAID to be low-priced and easily portable, the new "Turn-A-Weld" positioner was designed to weld such round parts as wheels, tractor rolls, tanks, etc. Designer of the machine is Dell Elliott.

The "Turn-A -Weld" has 40 speeds and an on-off foot switch. The machine features a revolving table adjustable to 60-deg from center and an 8-in. lathe chuck for welding pipe, tubing, etc. An arbor with taper cones can be fitted to it for welding hubs, wheels and similar parts. According to the designer, the machine will weld anything round, from 2-in. up.

TURN-A-WELD PRODUCTS, 2221 N. W. Thurman, Portland, Oregon.

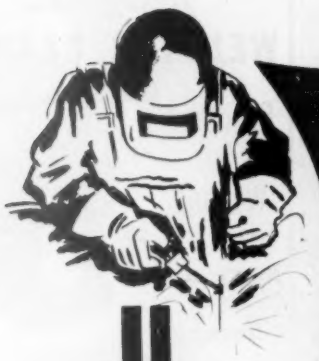


Wet-Blast Cabinet

Two main advantages are claimed for the new Belmont wet-blast cleaning cabinet: a more efficient blast gun and no pump to wear. A special "Whirlpool" mixing device does away with the need for an agitating pump.

Other features of the new cabinet are good ventilation and high lighting level, water-washed view window, counterbalanced door, hand holes, abrasive range from 50 to 2,000 mesh.

VACU-BLAST CO., INC., P. O. Box 885-WB, Belmont, Calif.



MORE continuous workable Amperes PER DOLLAR

miller INDUSTRIAL TYPE A.C. ARC WELDERS with

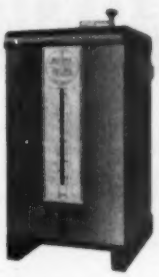
MODEL 88

For maintenance jobs or heavy duty welding MILLER Model 88 offers you maximum performance and high efficiency . . . today the ideal choice for all general welding applications. MILLER Model 88 is extremely compact, ruggedly constructed—and simple to operate . . . a continuous stepless current control provided through the easy-operating crank on top of the welder, and extreme arc flexibility are two of its outstanding features that makes it popular with welders. MILLER Model 88 carries full Underwriters' Laboratory Approval . . . operates on 220 volts 50/60 cycle A.C. lines, but dual voltage can be provided. Absence of magnetic arc blow results in faster welding and sound, dense welds.

MODEL 99

A moving coil transformer type industrial arc welder that meets the requirements for a compact, 250 ampere 50% duty cycle unit, with an unusually wide current range . . . from 20 to 350 amperes. Low initial cost plus high electrical efficiency sets a new high in arc welder values.

- Compact design . . . air spaced primary and secondary coils wound with high quality double glass covered insulated wire for trouble-free long life.
- Moving coil principle produces smooth "easy-to-handle" flexible welding arc.
- Operation from either 220 or 440 volts 60 cycle single phase lines standard.
- Sound, dense welds—and faster—due to lack of magnetic blow.



MODEL 100 SERIES

6 models to choose from for production welding. With MILLER 100 Series heavy duty industrial arc welders you can weld faster—on some jobs as much as 35% faster—because MILLER 100 Series welders eliminate the ill effect of magnetic arc blow . . . you can use larger electrodes and higher heat values. These MILLER welders are daily proving their efficiency in all types of industrial plants, shipyards, railroad shops, etc., wherever metallic arc welding is done.

Write Why not get the complete story on the MILLER industrial type, A.C. Arc Welders —TODAY. See your MILLER distributor.

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CLEANING BEFORE SPOT WELDING ALUMINUM

Improve quality of welds!
Increase number of spot welds before tip cleaning!
Prolong life of electrode tips!
Eliminate tedious, expensive mechanical cleaning!

DIVERSEY Pre-Welding Treatment for Aluminum

DIVERSEY no. 36 CLEANER

DIVERSEY no. 514 DEOXIDIZER

If you are looking for improved spot welds, increased production and lower costs, it will pay you to investigate the famous Diversey Pre-Welding Treatment for aluminum now . . . it's practical, proved superior, easy and surprisingly economical to use!

Diversey Pre-Welding Treatment is possible because of two outstanding Diversey developments . . . No. 36 cleaner for removing identification markings, grease and soil; No. 514 deoxidizer for removing oxide and heat scale!

A Diversey D-Man will be happy to show you the advantages of Diversey Pre-Welding Treatment for aluminum! No obligation! Write today! Complete information is available!

THE DIVERSEY CORPORATION
Metal Industries Department
1820 Roscoe Street • Chicago 13, Illinois
In Canada: The Diversey Corporation (Canada) Ltd. Lakeshore Road, Port Credit, Ontario

Powder Lance

THE Oxweld ACL-1 power lance utilizes metallic powder in its oxygen stream to pierce holes in blast furnace salamanders, concrete, cinder blocks, fire brick, aluminum billets, steel and cast iron containing inclusions and sand incrustations inside large castings. Any standard lance pipe, in single or multiple lengths, can be used with this lance. Positive-pressure powder control, with the aid of the new Oxweld D-9 powder dispenser, assures excellent piercing results with lengths up to 63 ft.

The Oxweld D-9 high-pressure dispenser (not shown) has a 200-lb capacity so that frequent charging is unnecessary. It delivers powder at conveying air pressures up to 100 psi to enable the lance to be used effectively with multiple pipe lengths. A relief valve on the dispenser vents at 100 psi for operating safety.

The lance pipe holder (shown above) works like a drill chuck; a twist of the wrist opens the holder and a reverse twist locks the lance pipe in place and seals it gas tight. Three interchangeable holder sizes are made: to fit ¼, ⅜ and ½ in. pipe.

LINDE AIR PRODUCTS Co., 30 E. 42nd St., New York City 17.

R-W Controls

NEW and improved controls for resistance welding recently developed by Weltronic include a special sequence timer, a control for gun welders and machines, a portable seam welder control and a special heat-slope control for nonferrous welding. All will be shown at the Metal Show in the Weltronic booth.

The special sequence timer employs plug-in interchangeable individual time delays. It was designed for special sequences, machine sequences and other special welding functions.

The N2X-J.I.C. control meets the requirements for both gun welders and machines. This is achieved by the use of a timer providing positive or negative hold plus standard 3B functions.

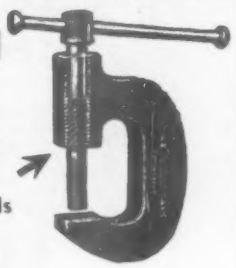
The control for gun-type portable seam welders, NEMA S5H, is a compact integral unit built to J.I.C. specs.

WELTRONIC Co., 19500 W. Eight Mile Rd., Detroit 19.

"Red Head" WELDING CLAMPS

• Designed for Welding •

No Threads To Damage



1. Case hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY
1968 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS

SPECIAL GLOVE DEVELOPMENT BY RACINE

THREE STYLES

- 380 Horsehide
- 384 Pearl Carpincho (wildpig)
- 386 Cowhide

Chrome tanned Heat Resistant Split Leather—Heat Breaker Back Lining—LARGE size—

1 One piece back.
2 One piece palm.
3 Thumb seam protected by wide leather strap.
4 All vulnerable seams welted.
5 Palm side of thumb is protected by extra leather overlay.

• Send for booklet on these and other GARDSMEN Protective Equipment.

RACINE GLOVE COMPANY, INC.
RIO, WISCONSIN

Our Man
IS YOUR MAN

The M & T representative is backed by a line of welding materials and equipment as complete as any available anywhere. In addition, he is a seasoned, practical welding engineer, well qualified to be of genuine help on your welding problems.

If the latest in welding techniques, equipment and materials can assist you, *our man is your man*—for orders or advice.

DETINNING • THERMIT WELDING • METALS and ALLOYS • ARC WELDING—Materials and Equipment CHEMICALS and ANODES for Electrotinning CERAMIC OPACIFIERS • STABILIZERS for Plastics TIN, ANTIMONY and ZIRCONIUM CHEMICALS

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Murex® Electrodes · Arc Welders · Accessories

WARTS ARE FOR TOADS, NOT WELDS

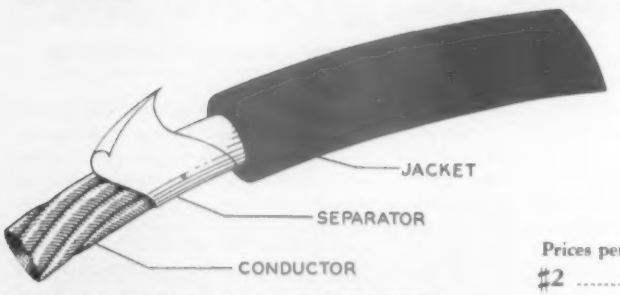
Spatter is usually a problem in arc welding . . . but these unsightly metal warts get the quick "brush off" with Protect-O-Metal No. 2. Simply brush or spray P.O.M. on weld area and adjacent surfaces. After welding, the troublesome weld spatter wipes off with a cloth or brush.

P.O.M. No. 2 causes no smoke, fumes or odors, is non-flammable and non-toxic. One coat serves for single or multi-pass welds, costs about 1/10c per foot, saves up to 85% of weld cleaning cost and labor. Order a trial gallon today. Satisfaction guaranteed.

PROTECT-O-METAL
POM
GWSMITH

G. W. Smith & Sons, Inc. **5408 Kemp Road, Dayton, O.**

"DALWELD" Super-Flexible Neoprene Welding Cable



DALWELD Welding Cable is Constructed of fine, soft, bare copper wires enclosed in a fine separator and sheathed with a tough, durable, oil and heat-resistant Neoprene jacket. DALWELD Welding Cable is specially designed to give the maximum of flexibility and to stand up under all types of heavy duty service.

Prices per Thousand Feet

#2	$220.00
#1	$255.00
#1/0	$315.00
#2/0	$395.00
#3/0	$475.00
#4/0	$585.00

Freight allowed on 200 lbs. or more. Cable packed in 250-Ft coils or 1000-Ft reels.

WRITE TODAY FOR COMPLETE PRICE INFORMATION

Dealer inquiries invited

DALWELD COMPANY, 1 Bertel Avenue, Mount Vernon, N. Y.

Courtesy Wall Colmonoy Corp.

Pump Parts Reclaimed

PUMP parts hardfaced with sprayed-on metal are lasting from four to eight times as long as new unprotected parts in oil producing and refining equipment. Above picture shows some of the pump sleeves, pump rods and compressor rods that were reclaimed by the J. P. Machine and Tool Co., Oklahoma City. The increased life is the result of the wear- and corrosion-resistance of the fusion-bonded alloy surface. Surface also has a low coefficient of expansion, which reduces packing wear.

After an extended period of operation, the sprayed surface can be resprayed, thus postponing the purchase of a new part indefinitely.

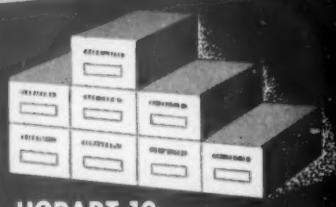
The first step in spraying a new or reclaimed pump part is to turn down the diameter in a lathe to allow for a final thickness of alloy of about 0.045 in. When this is done, the part, say a plunger, is blasted with steel grit to provide a rough surface to which the sprayed-on alloy will adhere.

The plunger is chucked in a lathe and rotated while the alloy is sprayed on with a pistol. The pistol, mounted in a holder attached to the lathe tool post, is traversed back and forth across the rotating workpiece until a uniform coating has been applied. The coating should be about 0.010 in. thicker than the finished OD.

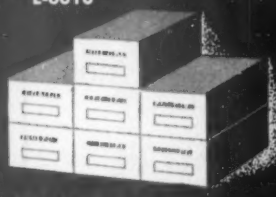
A fusion-bonded overlay is achieved in the next step by rotating the part in the same lathe under an oxyacetylene torch. Only sufficient heat to fuse the thin overlay is necessary.

The final step in preparing the pump plunger is to finish grind the diameter of the hardfaced surface to the correct dimension. In applications where a ground finish is not required, the surface can be turned with a carbide tool.

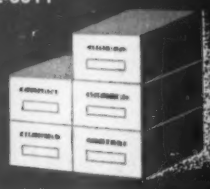
HOBART ELECTRODES



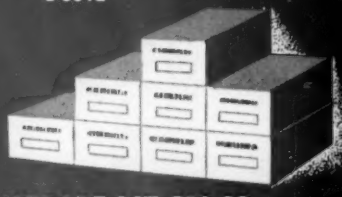
HOBART 10
E-6010



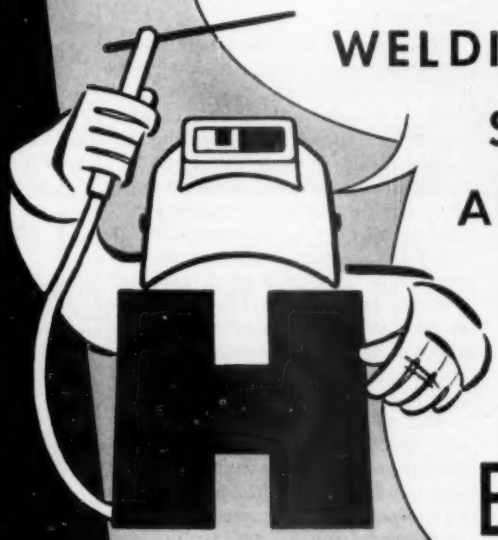
HOBART 335
E-6011



HOBART 12
E-6012



HOBART 447-313-13
E-6013



FOR FASTER, BETTER QUALITY WELDING WITH LESS SPATTER LOSS AND CLEAN-UP TIME... USE

HOBART ELECTRODES

PRODUCED IN HOBART'S NEW—MODERN ELECTRODE PLANT

Just name the type of electrode you need for your production ... DC or AC ... Mild Steel ... Cast Iron ... Stainless ... Hard surfacing ... Special Alloys ... Hobart has it.

Every manufacturing operation is based on having ALL CONDITIONS in the welding arc correct, thus insuring speedier welding, dependable joints, more production per hour, less waste due to splatter, less chipping and grinding. All of which adds up to lower welding cost, per pound, per foot, per hour when you use HOBART ELECTRODES.

FREE SAMPLES

of electrodes if you tell us the type of work you're doing. Check coupon.

Hobart Brothers Company
Box U-1031, Troy, Ohio

HOBART BROTHERS COMPANY, BOX U-1031, TROY, OHIO, U.S.A.

Gentlemen: Without obligation, please send me the items I've checked below.

- ☐ Electrode Samples (Type of work)_____
- ☐ Electrode Catalog
- ☐ Accessories Catalog
- ☐ Welder Catalog
- ☐ Weldor's Vest Pocket Guide

NAME_____ POSITION_____

FIRM_____

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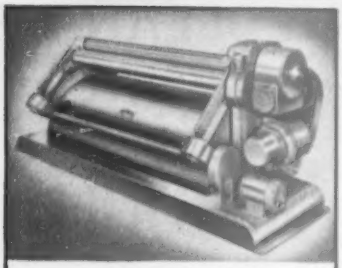
ENGINEERING CO.

Modern Metalworking Equipment

- BENDING ROLLS
- TURNING ROLLS
- AUTOMATIC WELDING FIXTURES



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- ★ In 18 models, ranging from 3 ft. x 10 ga. to 8 ft. x ¼" in capacity
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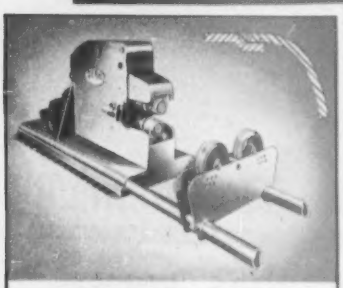
- ★ Durable, special bronze bearings
- ★ Power adjustment & air drop end available on most models



REED OFFSET FORMING MACHINE

- ★ Improves automatic welding production by eliminating chill-rings and backing bars
- ★ Forms offset weld-backing joggle from tank shell
- ★ Loosens rust and mill scale
- ★ Improves shell roundness
- ★ Two models: M-2—1/16 to 3/16" plate
  M-4—3/16 to 7/16" plate

WE INVITE YOU . . . to write us for specifications, prices, list of REED users near you. No obligation. Just write on your letterhead.

REED ENGINEERING CO.
1007 W. FAIRVIEW, CARTHAGE, MISSOURI

Battery Gas Explosion

Dear Sir:

With regard to your article, "How Accidents Are Born" in the June issue of THE WELDING ENGINEER, I will give you a true account of what could have been a very serious accident to all persons concerned.

A few days ago, as I returned to my shop from doing a pipe repair job, I was called over to the heavy equipment storage yard and asked to weld on a side door-latch of a gasoline-powered motor crane. I had my helper push the door into proper position and hold it—then I proceeded to weld the broken door-keeper to the adjoining panel.

Just as I finished welding, a violent explosion threw both of us to the ground. (I might say that before any work was started on this piece of equipment, it was ascertained that no hazard from oil or gasoline was present.)

Picking ourselves up, we made sure that the crane was not on fire and commenced to look for the cause of the explosion. This type of crane carries two 12-volt batteries to furnish electricity for its ignition and lighting system. These batteries are usually placed in the rear of the engine compartment.

It is the strict policy of this repair shop to remove all gasoline, oil and batteries from all equipment when any welding is to be done in or near the engine department.

However, on this crane the mechanic had moved the battery mountings up forward for his convenience in servicing them. This was unknown to me and so the batteries were not taken out when I began to weld.

As I was welding on the side panel, the paint on its inside surface began to burn and fall off. Because the crane had been running hard, the batteries were giving off a large amount of hydrogen gas. The burning paint eventually caused the gas to explode.

Blame for the accident, which caused considerable material damage, was placed on the mechanic for altering equipment without obtaining proper permission.

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FULL BODY PROTECTION FOR WELDORS
LONG WEAR THAT SAVE MONEY

Here is full body protection for all weldors. Chrome tanned, split cowhide—snap fasteners. Double stitching. Riveted at points of strain. Adjustable wrist. Small, medium, large. Extra large sizes available. No matter what type of leather welding outfit you want, we have it. Write for catalog and samples.

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1516 Callowhill St. Philadelphia 30, Pa.

HOLDENFLUX

new type paste flux

FOR SILVER BRAZING
COPPER, BRASS, BRONZE, STAINLESS, AND OTHER
FERROUS AND NON-FERROUS METALS
EASY ON THE HANDS

Always Uniform. Never Cakes. No Mixing.
Contains a new additive that speeds brazing.
Approved under Navy specification 51F4a.

Sold and billed through welding supply distributors. Or you may order direct, advising name of supplier.

Two Shipping Points: New Haven and Detroit

STANDARD RESEARCH, INC.
460 WE Grand Ave., New Haven, Conn.

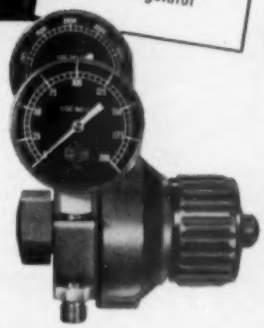
Ask your K-G Distributor about these

NEW K-G PRODUCTS

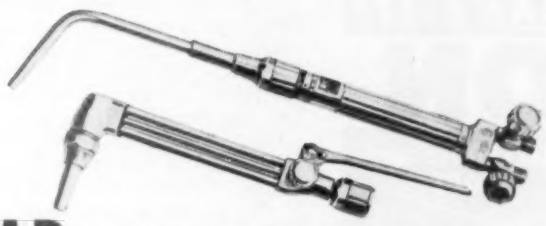
1100 Series Two stage
Illustrated: Model 1101 Oxygen Regulator

Pressure Regulators

1200 Series Single stage
Illustrated: Model 1201 Oxygen Regulator



Designed for today's higher cylinder pressures. 4000 lb. HP gauge (fuel gas models, 500 lb. gauge). Large capacity . . . smooth, non-fluctuating flow . . . accurate pressure control. Light, compact, rugged—anodized forged aluminum bodies and bonnets. Few parts, all readily accessible. NEW FOLDER on request.

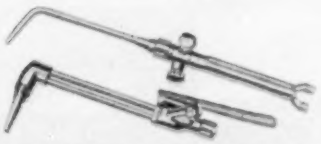


AP —All Purpose. Excellent for brazing, welding, heating, cutting. Welding tips 00-10, cutting tips 00-5.

Combination Torches

Three models. Economical to operate—well balanced—ruggedly constructed—moderately priced. Wide variety of tips—efficient universal mixers or individual mixer-tip assemblies. Neoprene seal rings. Cutting attachments designed to resist flashback. Trouble-free valves. CATALOG on request.

APM —Medium Duty. Welding tips 00-8, cutting tips 00-2. Tips available for brazing and cutting.



APL —Light Duty. Welding tips 00-5, cutting tips 00-2. Small, light. Excellent for silver soldering.

The K-G Equipment Company (Inc.) A unit of Air Products, Inc.

Dept. A, Box 538, Allentown, Pa.

Are REJECT WELDS killing your profits?

avoid scrap loss, reworks with DryRod Electrode Oven!

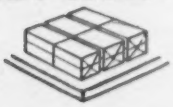
Engineers say most defects in high-strength welds — X-ray porosity, rough welds, underbead cracking, etc. — are caused by moist electrodes. DryRod — the original shop-tested circular electrode oven — safely preserves the manufacturer's "baked-in" quality . . . keeps rods within the .2% moisture limit allowed. Protect yourself against costly rejects, reworks, scrap loss . . . preserve electrodes conveniently, at low cost, with DryRod. Write for free bulletin.

Type 300 Oven

Automatic thermostatic control, 175 to 550° . . . holds 350 lbs. of 18" rods . . . safe, adequate 840-watt heater . . . completely wired for 110/220 or 220/440 volt AC . . . sturdy welded-reinforced sheet metal construction . . . insulated — low heat loss, low upkeep.

DryRod—Trademark X-DR-12

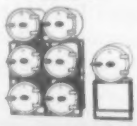
Cut costs 4 ways with DryRod Method



1 Store sealed cartons in warm, dry place.

2 Place unpackaged electrodes in DryRod Oven and withdraw as needed.

3 Locate DryRod as close to welding operations as possible.



4 For flexible, large-volume storage, stack ovens with compact DryRod Stands.

DryRod DIVISION OF **Phoenix Products Co.**
4715 N. 27TH ST., MILWAUKEE 16, WIS.

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KEEN-ARC CARBONS

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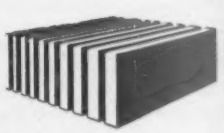
WELDER BRUSHES

The "right" brush for every type and make of welding equipment.

ELECTRODES and RODS

All standard types and sizes.

PLATES



1/4" thickness and up.

PASTE

Heat resistant, easily molded.

PLATES and PASTE ASSORTMENT

$24.50

A handy assortment, developed especially for welding departments or small welding shops.

COMPLETE BECKER ENGINEERING SERVICE
is always available and entails no obligation whatever.

BECKER BROTHERS CARBON CO. 3450 SOUTH 52nd AVENUE CICERO 50, ILLINOIS, U.S.A.

I hope this account will be of use to you.

Sincerely yours,
Hubert J. Donaldson
Cristobal, Canal Zone

Nose Doesn't Know

Dear Sir:

Never count on your nose to tell if a gas drum is safe to weld on. I have been welding for over 20 years and had to find this out for myself. So listen and read of others and don't find out the fatal way.

My father had in his garage a gas drum that had contained gasoline some four or five years ago. He asked me to weld a ½-in. coupling on the side, to be used for an oil supply for fuel. The caps from all of the openings had been removed for years. I smelled of the inside of this drum for gasoline odors and could smell nothing. My father also sniffed, with the same words, "No odor." We each took another turn at the smelling game and were confident that there was positively no trace of gasoline odors.

After making preparations for welding outside the garage, we again took a last minute smell of this drum. We both agreed sharply as to its safety. Down went the hood over my face and an arc was struck, which was the start of a hole to be burned in first. And, behold, a terrific escape of high pressure with a part explosive sound! I raised my hood in amazement. My father, who had been standing with his back about three feet from the end of the drum containing the plug openings, was now 10 ft across the driveway and his arm was burned up to the shoulder. Both ends of the drum were forced out considerably, including the rim on the edge of the drum. I was not injured in any way.

We looked at each other, and my father remarked, "I guess we got it fixed now." I said that I would finish the job to see if it would leak; to my surprise it did not. However, the drum now held three gallons more than its original capacity.

My advice to everyone is never to take a chance on a gas drum. The very least that should be done is to fill it with water before you start to weld. Never let your nose be your guide.

Elmer F. Lemke
E8208 Upriver Drive,
Spokane 61, Wash.

Electrode Wastage

Dear Sir:

I am a branch representative of the Council of the New Zealand Institute of Welding and give a number of talks and demonstrations in

MORE TIME FOR STEELMAKING... LESS TIME ON REPAIRS

You can keep steel-mill machinery on the job longer by using HAYNES hard-facing alloys to protect wearing parts. With hard-faced parts, you will have less down time and fewer repairs—more time for steelmaking. Illustrated here are some typical savings that have been made.

If you would like a copy of our hard-facing manual, which gives further information on the use of HAYNES hard-facing alloys, fill out the coupon below and mail it to us. For on-the-job help, get in touch with our nearest district office.

1 A yearly application of HAYNES STELLITE alloy No. 1 on this mud-gun screw for blast-furnace tap holes has eliminated monthly maintenance.

2 HAYNES STELLITE alloy No. 6 on the points of soaking-pit tongs has increased their life 19 times. Some hard-faced tongs have lasted as much as 50 times longer than unprotected ones.

3 The life of blooming mill shears has been increased 10 times by applying HASTELLOY alloy C on the cutting edge.

4 Entry guides for a bar-reduction mill used to wear out after handling 40 tons of steel. Guides hard-faced with HAYNES STELLITE alloy No. 6 last 4 to 5 times longer than unprotected ones.

5 Three years ago, some cone rollers in this bar-cooling bed were faced with HAYNES alloy No. 92. They are still in service.

"Haynes," "Haynes Stellite," and "Hastelloy" are trade-marks of Union Carbide and Carbon Corporation.

HAYNES Trade-Mark *Alloys*

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC

USE THIS HANDY COUPON

Haynes Stellite Company, 729 S. Lindsay Street, Kokomo, Indiana

Please send me, without obligation, a copy of the booklet, "HAYNES Alloys—Hard-Facing Manual."

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COMPANY _____

ADDRESS _____

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OR WELL CONSIDERED!

GOOD SOUND
BRAZED JOINTS
CAN'T BE MADE
WITH A POOR
BRAZING FLUX

IF your brazed joints have low strength, or leak . . .

IF you get joint voids, inclusions, and generally poor brazing results

DON'T blame the brazing alloy, the operator, or the brazing process until you have checked the capacity of the flux you are using . . . for more brazing failures are caused by the use of an unsuitable flux than by brazing alloy variables.

TRY THESE NEW EXTRA CAPACITY FLUXES made to new chemical formula.

RED LABEL FOR FAST HEATING

BLUE LABEL FOR TORCH HEATING

7 PERFORMANCE IMPROVEMENTS MEAN BETTER BRAZING AND LOWER COSTS

MADE BY THE PRODUCER OF United WIRE BRAZING ALLOYS

For complete information ask your WELDING SUPPLY DISTRIBUTOR or our nearest office

This new free 12 page illustrated bulletin RESEARCH STUDIES OF BRAZING FLUXES will give you a better understanding of flux functions and flux efficiencies and will mean better brazing at lower costs. Ask for Bulletin F-37.

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my district. At present I am working on the theme that welding operators are defeating the advantages of welding by their wasteful methods, which give higher resultant costs.

Could I use some of the data sheets which you have published to illustrate my points when having discussions at meetings? One in particular is the sheet covering electrode wastage. (Data Sheet No. 143, Aug., 1952. "What Per Cent of Your Welding Electrodes Do You Use"—Ed.) Naturally all references would be made with acknowledgment to THE WELDING ENGINEER.

May I offer my congratulations on your editorials, which give interesting and instructive reading with much food for thought.

Sincerely yours,
G. Crothers, Sales Manager
New Zealand Industrial Gases Ltd.
Palmerston North, N. Z.

Ornamental Iron Benders

Dear Sir:

I have been a subscriber to your magazine for a number of years now and have always thoroughly enjoyed your articles. In this last issue (July, 1953) you have an article, "Ornamental Iron Like Old New Orleans" and I was specially interested in it. I have been making some scrolls by hand as I have not been able to make a satisfactory bender to get the scrolls uniform. I would greatly appreciate it if you could send me more detailed information on the forms you mentioned in your article as being used to bend scrolls —how they are made, what is used, etc. Any pictures or descriptions of the bender itself is what I would like to have.

Yours truly,
G. P. Ferguson
Greenville, Miss.

Liked Our Apple

Dear Sir:

We have followed with interest not only your editorials but the imaginative treatment given the technical articles published in your magazine. Just one example of technical journalism at its best is "Atom Apple."

A good performance, when it is obviously good, often draws—ironically—no or little comment. People tend to assume that those who are responsible—know it. Or they assume someone else will toss the bouquet.

Sincerely yours,
F. W. MacDonald, Advt. Dept.
Air Reduction Sales Co.
New York City

BUY
SELL
USE
SHAWINIGAN
CARBIDE

SHAWINIGAN
PRODUCTS
CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

WELDERS' CLAMPS

HARGRAVE
Tested Tools
THE CINCINNATI
TOOL COMPANY

Each Tool Is
Individually
Power - Tested

Ask for CATALOG showing the most complete line of CLAMPS. Stock sizes from ¾" to 12' opening ½" to 16" deep.

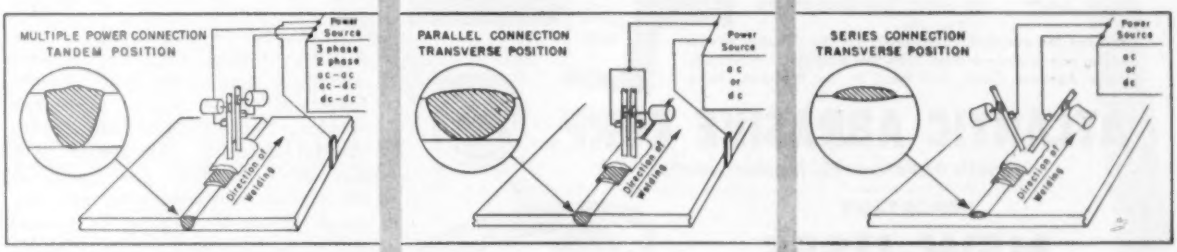
THE CINCINNATI TOOL CO.
1944 Waverly Ave., Cincinnati 12, Ohio

THERE IS AN INDUSTRIAL DISTRIBUTOR STOCK NEAR YOU

CUT YOUR WELDING TIME IN HALF *with* UNIONMELT Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.

Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.

Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE's engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

Linde TRADE-MARK

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Keep safety standards **HIGH**
. . . operating costs **LOW**
with **ATLANTIC**
Speed-Tested **WHEELS**

Make sure that your snagging operation is set up for maximum productivity, lower costs and complete on-the-job safety by specifying Atlantic Speed-Tested Grinding Wheels the next time you order.

You'll find that every Atlantic Wheel made—from the 2 inch size on up—is test run at a 50% higher speed than that required for normal snagging conditions . . . that every wheel features a special Resinoid Bond for extra safety and longer wear under high operating speeds . . . that their smooth, floating action requires less pressure, makes work easy. You'll find, too, that because they seldom have to be dressed, Atlantic Wheels eliminate downtime . . . keep costs at a minimum. They cut cleaner, faster . . . run cooler. Try them and see.

Send for the complete, fact-packed Atlantic Grinding Wheel Catalog now and check these important snagging advantages. Atlantic Abrasive Corp., 545 Pearl St., So. Braintree, Mass.

ATLANTIC ABRASIVE CORP.
South Braintree 85, Massachusetts

IMPORTANT
NEW USES
MEAN THAT YOU CAN
SAVE MONEY
WITH
3 in 1 "York's 77"
SPECIAL FLUX
FOR...

- GENERAL BRAZING
- CAST IRON BRAZING
- CAST IRON WELDING

NO NEED TO STOCK
3 DIFFERENT FLUXES
WHICH DETERIORATE
WHEN ONE CAN OF
"York's 77" 3 in 1 FLUX
MEETS ALL YOUR NEEDS

Make full use of the 4 famous features of "York's 77".
You will save money, save labor, and save time.

1. Fear of overheating can be forgotten.
2. Cleaning and grinding are unnecessary, because "York's 77" penetrates through grease, oxides, etc.
3. Chipping is unnecessary, because a satisfactory bond can be obtained on oxidized surfaces.
4. Deteriorated cast iron can always be welded successfully with "York's 77".

YORK ENGINEERING COMPANY
3349 OGDEN AVE. • CHICAGO 23, ILL.

W. A. DEWALD has been appointed sales manager for the three Cecil C. Peck Companies. He will have headquarters in Cleveland, where the sales activities of the Detroit and Pittsburgh offices will also be directed.

* * *

WILLIAM LOVEMAN, president of the Burdett Oxygen Co., was selected welding's "man of the year," by the Cleveland section of the American Welding Society at its recent 14th Annual Welding Symposium. Mr. Loveman's selection was based on his record of outstanding and unusual service to welding in general and to the Cleveland Section of AWS in particular.

* * *

E. D. ANDERSON has recently joined Tweco Products Co. and will serve as a special sales representative. While he will cover the north central states with headquarters in Kansas City, Mo., he will also do special work in all parts of the country. At the beginning of this year Mr. Anderson retired from Lincoln Electric Co., Kansas City, Mo., where he was district manager for the past 19 years. He is an active member of AWS.

* * *

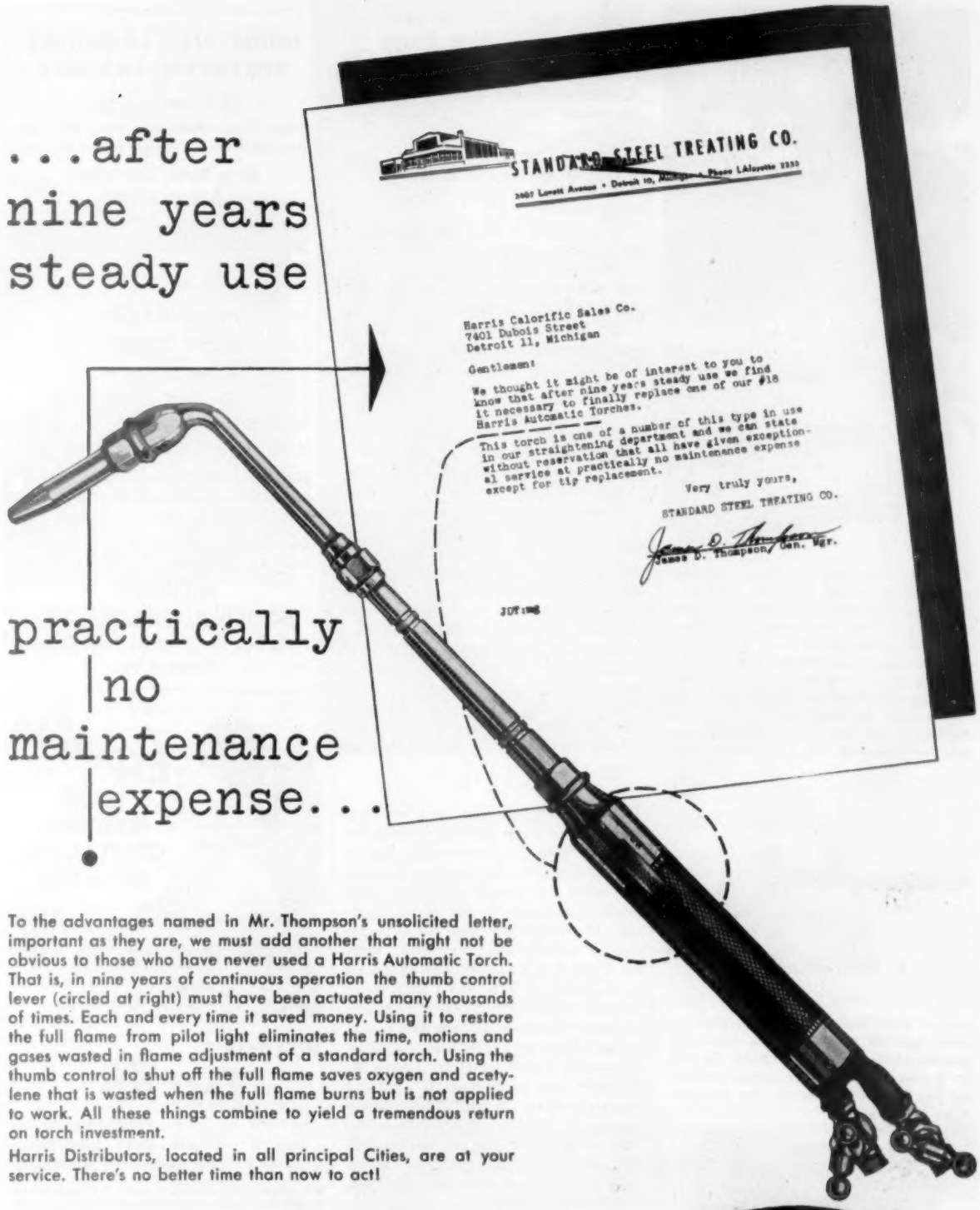
JAMES F. FAUSEK has joined the sales staff of the Modern Engineering Co., St. Louis, Mo., Mr. Fausek has just been released from active military duty after serving two years. He holds a B.S. degree from the University of Missouri and is the son of I. F. Fausek, vice-president of Modern Engineering Co.

* * *

WILLIAM J. THOMAS, general sales manager, has been appointed general manager of the Tubular Products Div., The Babcock & Wilcox Co. Paul J. Utnehmer, works manager, has been named to the board of directors of the division.

...after
nine years
steady use

practically
no
maintenance
expense...


STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #16 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

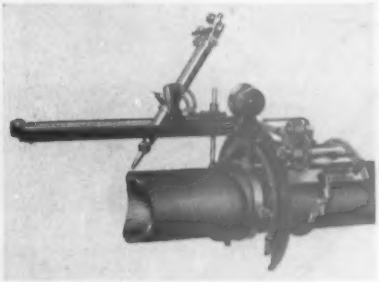
THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

If tedious hand-cutting and fitting is chewing up the profits in your pipe fabrication jobs, put a stop to it right now! Your time can be accurately estimated and more profit dollars assured by letting the H & M Shape-Cutter whip out your most difficult contour cutting problems in a matter of minutes. With the H & M here's all you do: Quickly attach the right pattern to your H & M Cutter and Beveler; lift the split horseshoe-shaped gear over the pipe; snap the spring-tension chain



fastener which locks the H & M securely in place; light the torch, adjust the flame and give the crank a few turns — THAT'S ALL, the job is done and you have a perfect, accurate cut, less reject welds assured. For more detailed information —

WRITE FOR THE FREE FOLDER
"MORE PROFIT DOLLARS IN PIPE FABRICATION"

H&M PIPE BEVELING MACHINE CO.

Trade Mark Reg. U.S. Pat. Off.

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Officers of the Cleveland section of the American Welding Society for 1953-54 are LEW GILBERT, editor of *Industry and Welding*, chairman; ROBERT J. HENRY, welding engineer, Cleveland Diesel Div., General Motors Corp., first vice-chairman; ALLAN P. STERN, president, Colonial Iron Works, second vice-chairman.

* * *

VIRGIL C. REED has been appointed field representative for the southeastern and southwestern states by the Alloy Rods Co., York, Pa. Mr. Reed, a native of Houston, Tex., has had wide experience in engineering and sales of the welding industry. He will make his headquarters in Houston.

* * *

J. H. MATTHEWS was appointed executive vice-president of Raybestos-Manhattan, Inc. He started with The Manhattan Rubber Mfg. Co. in 1914 and appointed assistant factory manager of the division in 1940. In 1942 Mr. Matthews became director of the company and assistant general manager of the division and by 1947 he was elected a vice-president of Raybestos-Manhattan, Inc. He is also vice-president of The Canadian Raybestos Co., Ltd., Ontario; in charge of the company's Wabash division, Crawfordsville, Ind., and the new Neenah, Wisc., plant, and a director of the Kentucky Synthetic Rubber Corp.

* * *

The following changes and appointments have been recently made by Lukens Steel Co., Coatesville, Pa. In the metallurgical department, HAROLD A. GRUBB was named assistant metallurgical engineer in the plant. SAMUEL D. LEMMON'S new title is assistant metallurgical engineer, service. PAUL R. CHANDLER was advanced to engineer of tests and CHARLES F. WILSON is now the assistant engineer of tests. GEORGE L. STROMAN was advanced to supervisor of the Miscellaneous Finishing Dept. JAMES M. QUARRY was promoted to assistant superintendent in the Plate Mills. ROBERT C. MCMICHAEL replaces Mr. Quarry as supervisor of the 140-206 Mill and OSCAR E. JACKSON, a 41-year veteran at Lukens, replaces McMichael as supervisor of the 120 Mill.

* * *

RAYMOND N. GRUBER has been named director of marketing research at the Standard Pressed Steel Co., manufacturer of metal fasteners and shop equipment, Jenkintown, Pa. Mr. Gruber succeeds Robert A. Reese, who recently left the company.

INDUSTRIAL LACQUERS
SYNTHETIC ENAMELS

All Colors Including

Olive Drab, Machinery Gray, Air Dry Enamels, Primers, Thinners, Baking Enamels

Every Batch Lab Tested & Guaranteed

Our purchase of JOB LOTS and SPECIAL CLOSEOUTS enable us to sell the very HIGHEST QUALITY materials at

UNBELIEVABLY LOW PRICES

For Example:

We have regular stocks of
MACHINERY GRAY LACQUERS
No Primer Required—$1.00 per gal.

Zinc Chromate Primer	1.75 gal.
Red oxide primer surfacer	2.00 gal.
Gray lacquer primer	1.25 gal.

Describe your finishing operations and let us send you a gallon sample at NO CHARGE.

MICHIGAN INDUSTRIAL FINISHES CO.
P.O. Box 96 31st St. Post Office
Detroit 10

WELDOR'S
Test Kit

CONFORMING TO
AIR, NAVY, ORDNANCE
SPECIFICATION MIL-T-5021

Kit consists of 2 clusters, 1 plate, 2 crosses, 2 sets of tubes; all made of chrome molybdenum. Can be used to practice for and to take tests by Government inspectors. Saves you trouble of making up test specimens. Shipped from stock. Supply them to your welders and get better results on your Government welding tests. Write for further data and quantity prices.

CBC WELDING CORP.
422 EAST 102ND ST.,
NEW YORK 29, N. Y.

W. D. SULLIVAN has been named regional manager of the boiler division of The Babcock & Wilcox Co., Beaver Falls, Pa. He was formerly the assistant works manager of the company's tubular products division. Mr. Sullivan has been with Babcock & Wilcox since 1916.

* * *

Died . . .

CURTIS W. MCGRAW, 57, president and chairman of the board of the McGraw-Hill Publishing Co., died Sept. 10 in New York City. He was the third son of the late James H. McGraw, Sr., founder of the company. A graduate of Lawrenceville School and Princeton University, he was a major of infantry in World War I and saw service in France. He came with McGraw-Hill in 1920 and has since served as vice-president, treasurer, director, president and chairman of the board. Mr. McGraw was very active in business and civic affairs, including the publishing fields, charity and welfare groups, field and gun clubs, golfing associations and manufacturers' associations. A resident of Princeton, N. J., he is survived by his wife, Mrs. Mildred W. McGraw, a daughter, and three brothers, Harold W., James, H., Jr., and Donald C.

* * *

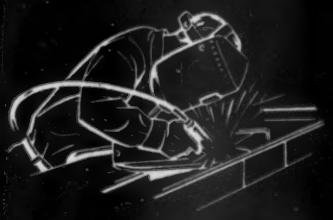
HENRY O. WESTENDARP, 83, Saugus Center, Mass., died Aug. 10. He was associated with the General Electric Co. for more than 40 years, starting out in the old Thomson laboratory. He was an honorary member of the AWS Boston chapter and a charter member of that section. Two of his four sons are active in the welding industry, H. O. Westendarp, Jr., sales engineer for the G-E welding department in New York and Edwin M. Westendarp, vice-president and general manager of the Morgan Aluminum Welding Rod Co., Cleveland.

NOW a full line of

Liquid

ARC WELDERS

FOR EVERY ARC WELDING APPLICATION



"LIQUID"
SELENIUM RECTIFIER
TYPE D. C. ARC WELDERS
One of the complete line of Liquid Arc Welders

NOW... LIQUID PRESENTS

Arc Welding Equipment incorporating all of the advanced design and rugged dependability of the famous Liquid GASWELD line.

Several desirable territories are still open for Jobbers and Distributors of Liquid Red Diamond Arc Welding Equipment. Write for full information.

NOW . . . LIQUID IS READY

to serve *any* and *all* of your welding equipment requirements . . . better, faster and more efficiently.

And, as with all Liquid products, sales and service is as convenient as your telephone.

Liquid also produces Oxygen, Acetylene and other commercial gases including CO_2 in all its forms —Gas, Liquid or Solid (dry ice) for industrial use.

MAIL COUPON FOR FREE CATALOG TODAY!

THE LIQUID CARBONIC CORPORATION
INDUSTRIAL GAS DIVISION
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Gentlemen: Please send me my free catalog showing the new Liquid line of Red Diamond Arc Welding Equipment.

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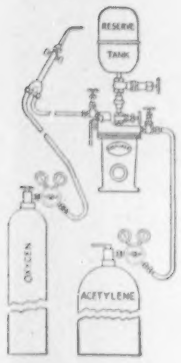
HERE ARE SAVINGS!

FOR MEN WHO USE TORCH BRAZING IN PRODUCTION WITH BRONZE OR SILVER ALLOY BRAZING ROD

The GASFLUX Brazing Process is now making these savings:



A GASFLUXER can be installed in your production line in less than 2 minutes, without disturbing any standard set-up. Works equally well with acetylene, city gas or other fuel gas. Uses standard torches and tips.

Steel Tube Furniture: Leaves finished work so clean that it can be painted, sprayed or dipped without any flux removal whatsoever, thereby realizing a considerable saving in cost.

Refrigeration Unit Brazing: Reduces leakers by more than 60 per cent. Less cleaning necessary after brazing. Lower cost per joint through savings of both flux and alloy.

Tube-Within-Tube Joints: Much greater penetration results in a considerable decrease in leakers. Prevents formation of black oxide scale.

Metal Cabinets: Better penetration of brazing alloy results in much fewer rejects. Grinding time shortened. About 25% improvement in production.

A request on company letterhead will bring details of procedures used in any of these applications.

The Gasflux Company

198 Wayne Street — Mansfield, Ohio

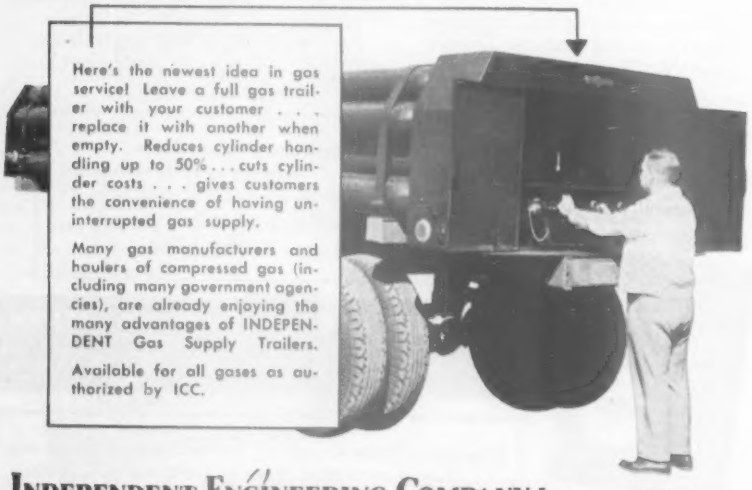
REDUCE CYLINDER HANDLING

Up to 50% with INDEPENDENT Gas Supply Trailers!

Here's the newest idea in gas service! Leave a full gas trailer with your customer . . . replace it with another when empty. Reduces cylinder handling up to 50% . . . cuts cylinder costs . . . gives customers the convenience of having uninterrupted gas supply.

Many gas manufacturers and haulers of compressed gas (including many government agencies), are already enjoying the many advantages of INDEPENDENT Gas Supply Trailers.

Available for all gases as authorized by ICC.



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CONSULTING · RESEARCH · DESIGNING

Manufacturers of CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

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We Invite Your Inquiries

Welding Services Pay Off for Railway Supplier

A SPECIALIZED welding repair program on railroad switches, frogs and crossings has been a top business for Morrison Railway Supply Corp., Buffalo, N. Y., for 25 years. Much of this service is now on annual contract basis and a mobile unit, two men and their welding equipment, visit each worksite at periodic intervals to do the maintenance. The service is being used at present on trunk line and short line railroads and in large industrial railyards.

Morrison's Metalweld Process Division estimates that it can repair a frog for about $30. It is said that a railroad would have to pay more than that in labor to remove the frog and replace it with a new one. By regular maintenance, frogs have been reconditioned on the spot as many as eight times before replacement.

The business started in the mid-1920's with the purchase of the patent for reconditioning switch points and the obtaining of a patent for arc welding alloy steel. Early Morrison customers shipped worn frogs, switches and crossings to Morrison plants in Indianapolis, Buffalo and Chicago.

A big hurdle to more business was cleared when R. L. Morrison, president of the company, worked successfully to get the Interstate Commerce Commission to rescind its rule which forbade welding in track under traffic. He set up mobile crews to do the needed work on the spot. Many trunk lines now have their own crews which use the Morrison patented method of welding maintenance.

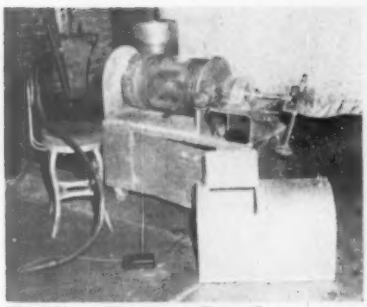
About 50% of the Morrison Metalweld business comes from large industrial customers who need considerable maintenance in their railyards. Morrison customers include the biggest steel mills, fabricating shops, cement mills and chemical plants in the country.

One contract is with the terminal in Washington, D. C., which is operated by three trunk lines. A crew was sent in seven years ago to do some work and is still there, fully occupied in the busy yard.

* * *

Distributors Take Cruise

A WEEK's cruise aboard a 79-year-old sailing schooner was the recent vacation of Charles McKinney, McKinnery Welding Supply Co., New York, and Sol Buckwald, of Allied Service and Supply Co., New York. Their route took them through the hundreds of islands by Penobscot Bay off the Maine coast.



Welding Fixture Speeds Diesel Piston Repair

BUILDING up ring grooves on a worn-out aluminum Diesel piston is greatly simplified by a fixture developed by engineers of The Minnesota Transfer Railway. The fixture not only rotates the piston but has an attachment for holding and turning Diesel valves for hardfacing. Welding of the grooves is done with a portable "mig" welder with hand torch and a selenium rectifier source of welding current.

The fixture consists of a cabinet-like stand (see above) made of ¼ in. welded sheet metal, upon which is mounted the turning mechanism. Two ½-in. metal plates which support the turning shaft are welded 2½ ft apart in an upright position on top of the stand. Tops of these plates are cut in a half-circle to accommodate a light metal hood which fits over the work and retains the preheat. Before the grooves are built up they are machined out 1/16 in. on each side and on the bottom. This is followed by preheating to 300-400 F with an oxyacetylene torch.

Pistons are held in position as if they were lathe-mounted. They are threaded on the top end to fit and tighten into a small spindle. A center head on the power shaft fits into the bottom end of the piston for turning. Welding is performed down-hand through a 12 by 8 in. opening in the hood. A metal door closes over the opening between operations to prevent loss of preheat.

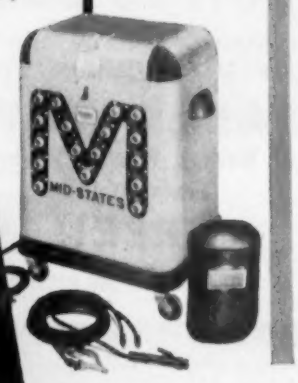
A single ring groove on a 12½ in. piston can be built up in 30 minutes with d-c reverse polarity at 240 amp. Argon flow is 25-30 cfh.

An extension of the piston-turning shaft permits its use in the rotation of a valve for hardfacing work. The end of the shaft is set in a small fixture which holds a valve at a 45-deg angle for downhand welding. Bevel gears on the end of the shaft and on the fixture transmit the turning motion from shaft to valve. A 1/16 in. to ⅛ in. deposit can be applied to a 4-in. valve in 30 minutes with this set-up, according to Oxweld Railroad Service Co., a division of Union Carbide and Carbon Corp.

Mid-States Simplified Welding

Cuts Production Costs!

- AUTOMATIC ARC STARTING
- INSTANT AMPERAGE CHANGES
- WELDS FERROUS AND NON-FERROUS METALS
- UNVARYING OUTPUT—NO "CREEPING"
- NO PRESSURE TO CAUSE PINHOLES
- NO MOVING PARTS TO WEAR OUT
- 100% PENETRATION—SMOOTH BEADS



You Can Do a Better, Faster, Easier Welding Job with these HEAVY DUTY Mid-States ARC WELDERS

Other Mid-States Arc Welding Equipment and Accessories

The "BULLDOG"

New Combination Arc Welder and Battery Charger — reconnectable for 110 or 220 volts. An all-around heavy duty portable welder.

For Automatic Arc Starting on All Welders

The "Missing Link" overcomes the necessity of "pecking" or "scratching" to start the arc, even with welders of low open circuit voltage. Any welding rod, A.C. or D.C. can be used.

No. 9000 ARC TORCH

A versatile torch that assures sound welds on all metals—ferrous and non-ferrous. For A.C. or D.C. electric welders. Does brazing, soldering, hard-surfacing, heating, straightening and bending.

• Operators do not need special skill to do a perfect welding job with Mid-States Heavy Duty Welders. You can weld heavy and light gauges, even 22 gauge, without danger of burning through. In addition you can do brazing, soldering, hard-surfacing and heating.

Plug-in type welder transformers are wound throughout with double glass covered magnet wire and stacked with high grade electrical sheet. The Mid-States Heavy Duty Welder is a complete outfit for every welding need.

Write today for complete descriptive literature and the Simplified Welding handbook.

Mid-States WELDER MFG. CO.

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ALLOYS
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HOW TO DO IT

Condensed Versions of ALL an Operator Needs to Know to Swing to

EASIER WAYS

of Welding, Brazing, Soldering, Tinning, Cutting

FREE!!

Which one do you want?

All-State Welding Alloys Co., Inc., White Plains, N. Y.

I've checked the "How to Use and Apply" folder I want.

■ DOC ALLOYS KIT — Generous sampler of 11 torch applied ALL-STATE alloys, 8 fluxes, 1 galvanizing powder.

■ ALUMINUM and ALUMINUM ALLOYS — World's most complete line of aluminum alloys and fluxes — ALL-STATE.

■ COPPER and COPPER BEARING ALLOYS —10 ALL-STATE alloys and fluxes for work on copper and copper-bearing alloys.

■ STEEL — 13 ALL-STATE alloys and fluxes for work on STEEL.

Name_____

Address_____

Company_____

Big Testing Machine Installed at McGill

TESTING of weldments, large castings, structural members and other such structures will be open to industries in the Montreal area since recent installation of a new hydraulic testing machine of 400,000 lb load capacity at McGill University, Montreal, Canada.

Final installation tests were made recently by Baldwin-Lima-Hamilton Corp., Philadelphia 42. The new machine is 22 ft high overall and has 6½ ft clear space between columns. Maximum compression space below the sensitive crosshead is 12 ft and maximum tension space is 11 ft 2 in. without allowance for stroke, which is 10 in. maximum.

An unusual feature of the installation was made possible by placing all power equipment on the crosshead and by the fact that no part of the machine is below floor level.

McGill had three reasons for installing the new machine: it is a research tool capable of taking large structural members and testing them in their working range; it can be used for undergraduate demonstrations to large classes and it is available to industries in the Montreal area for testing structural members, weldments, etc.

* * *

German Welding Confab at Mannheim, Oct. 15-17

OUTSTANDING German authorities on welded construction will speak Oct. 15 to 17 at a special conference on welding engineering at Mannheim, Germany. The meeting is sponsored by the Deutscher Verband fuer Schweisstechnik Ev., Mannheim. The following welding problems will be discussed: shrinkages, shrinkage stresses, danger of brittle fracture, fatigue properties and distortion.

Speakers include Professors R. Weck, University of Cambridge, England; M. Pfender, materials testing laboratory, Berlin-Dahlem; K. Wellinger, Technical University, Stuttgart; J. Beckstroem, Technical University, Berlin - Charlottenberg; H. Emschermann, Berlin-Dahlem and K. Kloppel, Technical University, Darmstadt.

* * *

Correction

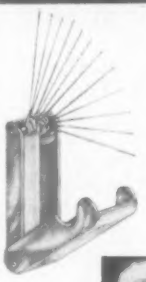
In our August issue we stated that SIDNEY SCHWARTZ was general manager of sales and manufacturing for Acme Spot Welding, Inc. Mr. Schwartz informs us that he is not aware that he has changed jobs and asks us to reassure his friends that he is still general manager of the Ames Spot Welder Co., Inc., Brooklyn, N. Y.

It's a pretty long time when you apply it to the use of a Welding Torch. It means thousands and thousands of hours of use. Have you heard about the *Lifelong Guarantee* of Smith's Welding Equipment? Want to know more about it and what that kind of service can mean to you?

Drop us a card right away.

SMITH WELDING EQUIPMENT CORPORATION
Dept. WE-71, 2633 S.E. 4th St., Minneapolis, Minn.

Welding Engineers prefer THERMO spiral tip cleaner design...



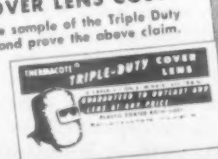
So do welders because they know how the spiral design of Thermo Tip Cleaners removes carbon and slag without scratching or enlarging. Buy Thermo Spiral Tip Cleaners in handy metal case. 12 sizes.

Precision manufactured and guaranteed unbreakable or replaced free.

SAVE 95.5%
ON COVER LENS COST

Send for free sample of the Triple Duty Cover Lens and prove the above claim.

At all Welding Supply Dealers



THERMACOTE CO.
NEWARK • CHICAGO • LOS ANGELES

New San Jose Distributor Opens Shop

KEN Lutz, formerly general field manager for All-State Welding Alloys Co., has purchased the welding supply division of Bruce Barton Pump Supply Co., San Jose, Calif. The new firm will be known as the San Jose Welding Supply Co. Located temporarily at 940 So. First St., it will soon occupy new quarters at 1000 So. Second St. The new building will be 50 by 80 ft. with parking facilities and ample showroom space in front.

Mr. Lutz began his welding career in the Navy in 1935 and worked at Welders Supply Co., Seattle; Ferrofix Welding & Engineering Co., Seattle; Puget Sound Naval Shipyard, Winslow Marine Shipbuilding Corp. and also as a senior inspector, ship construction, (welding) Bureau of Ships. During the past five years Mr. Lutz has conducted 170 clinics and 1,600 plant demonstrations.

* * *

New York Distributor Sells Business

JAMES P. Ruddy has purchased the T. W. Smith Welding Supply Co., 446 W. 54th St., New York City from Edward G. Fulton, the owner. The Smith firm was involved in a prolonged strike with the Teamsters Union from Nov., 1952, until May, 1953. After seven months of negotiation, the business has been sold to Mr. Ruddy but it will retain the same name, work force and location.

* * *

Welding Helps Speed Aussie Ship Repair

WELDING and flame-cutting processes helped return the 11,000 ton tourist vessel "Kanimbla" to service earlier than scheduled after it had been severely damaged in a grounding accident. When towed to the graving dock, it was necessary to remove 170 tons of steel plate from the ship as 300 ft of the bottom plating had been damaged.

Temporary patches were welded over the more badly damaged sections so that the ship could go alongside the wharf and unload its cargo. When it returned to the dock, rivet-cutting machines removed 51 plates from the outer shell. Thirty were so badly damaged that new plates had to be cut and shaped. To carry out these major repairs in time, 150 men worked 12 hour shifts. The work was finished several days earlier than the three months stipulated.

—*McGraw-Hill World News*

lightweight fully insulated

CADDY

TYPE B Electrode Holders

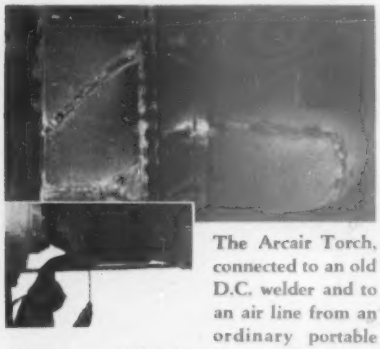
Connected by the CADWELD PROCESS—
the greatest advancement in arc welding
in 20 years.

On Display
NATIONAL METAL SHOW
Oct. 19-23 Booth 1011

CADDY ARC WELDING
ACCESSORY DIVISION
ERICO PRODUCTS, Inc.
2070 E. 61st PLACE, CLEVELAND 3, OHIO

ARCAIR gouging torch helps save six months "down time" for Ohio grading contractor

H. W. Stepler of Rocky River, Ohio was faced with six months "down time" and a $1200 repair bill on his 14-ton grader. A sheared bolt had shattered the cast iron transmission case into a jig-saw puzzle of cracks . . . only a heavy chain and turnbuckle held the broken case together.



The Arcair Torch, connected to an old D.C. welder and to an air line from an ordinary portable compressor, did a fast job of gouging all the cracks in less than two hours . . . a job that would have taken several days by other methods. The resulting clean, uniform "V" groove provided good weld penetration . . . after ten months there is no sign of cracking.

Total cost, excluding welding time, was $20, a saving of over $1,000 and 6 months "down time."

Write for Free Bulletin with facts and photographs of other time and money-saving applications of the ARC-AIR Torch. Arcair Company: *EASTERN DIVISION*, 423 So. Mt. Pleasant Ave., Lancaster, Ohio; *WESTERN DIVISION*, P. O. Box 4107, Bremerton, Wash.

Weld Strength Calculator Prepared by Lukens

A UNIQUE weld strength calculator has been developed by engineers at Lukens Steel Co., Coatesville, Pa. For the convenience of designers, engineers and others interested in steel plate fabrication, it indicates both the size of weld required for a given load and the weight of a given weld in lbs. The calculator gives values for stresses ranging from 2,000 to 20,000 psi and applied loads of from 9,000 to 450,000 lb.

In form, it is a durably-made plastic slide rule, having on its reverse side some basic design data for welded connections. Formulas for calculating nominal properties of welded connections are listed in convenient form. The slide-rule is a companion tool to Lukens' plate size selector. They are available from Lukens' marketing service department.

* * *

West Coast Firms Pool to Get Business

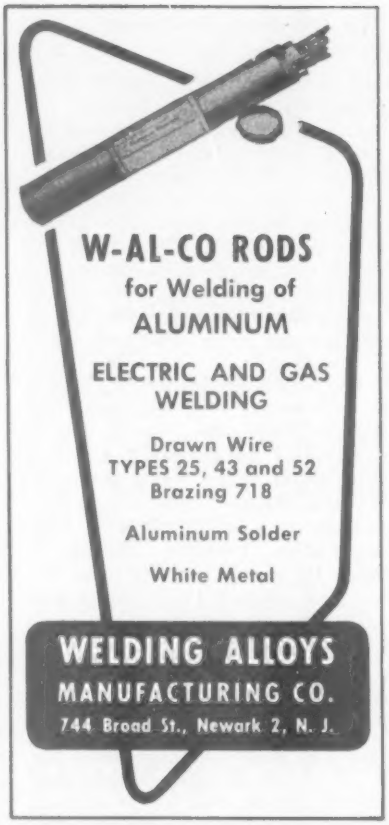
A NEW small business production pool, known as United Western Manufacturers, Inc., has been formed to seek defense contracts in the metal working industry. Welding and specialized fabricating and engineering are the skills offered to the customer.

The following firms are members: Aircraft Div., Calnevar, Inc., Los Angeles; Certified Welders & Engineering Co., Los Angeles; Harford Mfg., Inc., Culver City, Calif.; Modern Plating Co., Los Angeles; Telair Engineering, Inglewood, Calif. and Tubing Appliance Co., Inc., Los Angeles.

The group will perform sheet metal fabrication as applied to the frame industry; high quality precision machine parts, engineering research, design and development as related to air frames; specialized hydraulic equipment; specialized tools and tooling; metal finishes and finishing and the design and development of electro-mechanical equipment.

* * *

STEEL DATES—1910: *The use of cobalt as a alloying element in tool steels was proven beneficial, but it was several years before such additions became general in the tool steel industry. Cobalt was used in magnet steel about 1916.*



Now you can accurately, easily flame cut all kinds of shapes — circles, angles, bevels, straight lines. NEECO cutting guides convert ordinary hand torches into precision cutting instruments. Attached quickly — without tools. Neat, clean cuts need little or no grinding or machine finishing. Models to fit all torches, from 70° to 90° types. Cut circles from 1 to 66 inches diameter. Every shop should have these new guides — as basic, time saving tools or as standby equipment.

The new NEECO guides are of three types —for small circles (shown above), for large circles, and for straight lines.

Write for illustrated Bulletin 101 and model selection data.

NEECO *Precision Flame Cutting —Fast and Exact!*

NEW ERA ENGINEERING COMPANY
458 West 29th St., Chicago 16, Illinois

Big Derrick Used at Sarnia Refinery

A NEW 150-ton erection derrick, the largest of its type ever designed and built in Canada is employed in refinery construction this fall at Sarnia, Ont. Built by Dominion Bridge Co., Ltd., it is equipped with a 160-ft boom and a 180-ft mast mounted on a spherical roller thrust bearing. It utilizes a 20-ft diameter bull wheel. All sheaves are equipped with roller bearings.

Design of the derrick permits the boom and mast to be used independently as poles, a frequent requirement in handling heavy vessels. An additional 20-ft section of boom has therefore been made with this object in mind.

Total shipping weight of the derrick is about 140 tons. Five railroad cars were needed to carry the derrick from the shops where it was constructed at Lachine, Que.

* * *

Wolfenden Supply Adds P. R. Mallory Lines

NEWEST group of welding products available at Wolfenden Welding Supplies, Cleveland, is the P. R. Mallory line of resistance welding electrodes and accessories. Wolfenden is also distributor for Hobart Bros. Co., All-State Welding Alloys Co. and Smith Welding Equipment Co.

William Homany has been appointed sales engineer for Wolfenden. He has 13 years experience in specialty alloy rods, gas equipment and welding supplies.

* * *

Honolulu Iron Works To Sell Nelson Studs

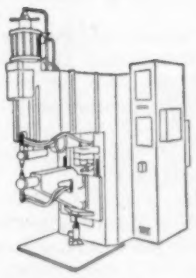
APPOINTMENT of the Honolulu Iron Works Co. as a distributor of Nelson Stud Welding fasteners and equipment has been announced by Nelson Stud Welding Div., Gregory Industries, Inc.

Stud welding guns, as well as "Nelwelder" welding machines and portable battery power sources will be available for purchase or rental through the Hilo Iron Works, a subsidiary of the Hawaiian firm. Hawaiian Gas Products will continue to distribute Nelson products as in the past.

* * *

STEEL DATES—1898: *F. W. Taylor and M. White began to conduct the heat treating experiments which resulted in tungsten tool steels, now called high speed tool steels. Prior to this tungsten had been used with manganese and chromium to make a "self-hardening" alloy steel. It was also used in magnet steels.*

HERE'S WHAT WE MEAN BY *Engineering Assistance*



Application Engineers

T-W's Application Engineers work with you on properly applying resistance welding to your product. They give you specific answers and recommendations for your product and your production.

Design Engineers

The Design Engineers are specialists in creating welders specifically for your work. They take over when the Application Engineers have worked up the basic requirements with you.

Field Engineers

T-W has Field Engineers available in the areas near the cities listed here. They can give you on-the-spot, authentic answers to your questions. They will save you a lot of time. When you operate your welding equipment, they are on call to give you service.

Resistance Welders Since 1898

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PHILADELPHIA · PORTLAND, OREGON
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TAYLOR-WINFIELD
RESISTANCE WELDERS

THE TAYLOR-WINFIELD CORPORATION • WARREN, OHIO

Selecting optimum welding heat is easy with the portable Mullenbach ARCTROL . . . permits voltage adjustments while you weld, where you weld!

Saves time-wasting trips to the welding machine, eliminates voltage approximations, permits instant remote control as job requirements vary. A necessity on precision welding—a tremendous help on production welding!

Completely portable, foot operated. Normal welder range unaffected. Available for most makes of D.C. Welders. *Write for folder; include name and model of your welder.*

Mullenbach
Electrical Manufacturing Co.
2300 East 27th Street, Los Angeles 58, California

Lincoln Electric Builds Plant near Paris, France

MACHINERY has already been shipped to France for a new foreign subsidiary of The Lincoln Electric Co., Cleveland. The new factory represents a $500,000 investment and is a few miles southeast of Paris on the Marne River at Port de Bonneuil.

The 112 tons of machinery and equipment for the plant were shipped from Cleveland on a Swedish-American freighter. The equipment was expected to be in operation by the last of 1953.

Lincoln officials said the new facility would manufacture flux filler rod and supply cut wire for electrodes for the Armco International Corp.'s subsidiary, S. A. Armco of Paris. Later, Lincoln will expand into additional lines.

R. Proctor, Ferris, formerly head of Lincoln's engineering purchasing department in Cleveland, will be general manager of the new plant.

Lincoln now has subsidiaries in Canada and Australia and licensed affiliates in England, South Africa, Mexico, Brazil and Argentina.

* * *

KSM Products Expands Western Operations

SALES engineering offices have been opened in Denver and San Francisco by KSM Products, Inc., Merchantville, N. J. At the same time KSM appointed the Johnson Supply Co., 1414 Wazee St., Denver, as Rocky Mountain area distributor for KSM stud welding equipment and studs.

Heading the Denver office is S. G. Kern. His office will be in the Commonwealth Building. Robert F. Chapman, 785 Market St., in charge of San Francisco sales.

* * *

Arcair Opens Eastern Sales Office

THE Arcair Co., Bremerton, Wash., has opened an eastern sales and distribution office at 423 South Mt. Pleasant Ave., Lancaster, O. This is the first major expansion of the firm from its original location at Bremerton.

* * *

40% More Space at National Electronics

THE newly completed addition to the factory of National Electronics, Inc., Geneva, Ill., increases floor space by 40%. The new brick building is used for production of thyratrons, rectifiers and ignitron tubes. Production this year is 35% ahead of 1952, says John H. Hutchings, vice-president.

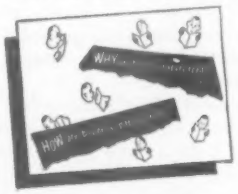
All business is specialized

. . . and nothing specializes on your business like your business paper

This smart business man spends his time where every sitzmark parks a prospect at his feet. He *specializes*. Your business is specialized, too . . . and so is your business paper. It's concentrated on *your* business. Both editorial and ad pages report what's new that's good . . . suggest new methods . . . gather in one place a raft of ideas on where-to-buy-what.

That's help you can't find concentrated into such quick reading time anywhere else! It's simple sense to read every page . . . every issue.

This business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. It's a *paid* circulation paper that must *earn* its readership by its quality . . . And it's one of a leadership group of business papers that work together to add new values, new usefulness, new ways to make the time you give to your business paper still more profitable time.



A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet." Room 2710.

McGRAW-HILL PUBLISHING COMPANY
330 W. 42nd St., New York 36, N. Y.

One of a series of ads prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

30 YEARS AGO

(Taken from THE WELDING ENGINEER *of Oct., 1923)*

PURCHASE of a new building two blocks east of Michigan Avenue in Chicago has been announced by The Bastian-Blessing Co. Gross floor area is about 100,000 sq ft, all of which will be needed for increased production.

—30 YEARS AGO—

As a safety precaution, the Bastian-Blessing Co. is making the new "Rego" valves with the words "Use no Oil" forged on the body of the valve in raised letters. This new practice is the end result of a discussion on safety at the 1923 convention of the Gas Products Association in Chicago.

—30 YEARS AGO—

C. J. HAINES has joined the staff of M. Keith Dunham, Chicago, selling liquefaction oxygen producing plants.

—30 YEARS AGO—

JOHN R. BRANT, president of the Indiana Oxygen Co., Indianapolis, has just returned from a long auto trip through Wisconsin. It is understood that this trip represents his annual attempt to escape from hay-fever.

—30 YEARS AGO—

PROF. Elihu Thomson, director of the Thomson Research Laboratory, General Electric Co., recently gave a history of welding at a joint meeting of the Northern New York section of the American Welding Society and the Schenectady branch of the ASME. Prof. Thomson first conceived the idea of electric welding in 1877 during a lecture course he was giving at the Franklin Institute in Philadelphia.

—30 YEARS AGO—

WELDING exhibits in European industrial expositions seem to make a powerful impression because they are in a special section, notes the editor. Here in America, some of the value of the welding equipment being shown is played down because welding booths are mixed in with every other type of metalworking equipment.

—30 YEARS AGO—

AMONG speakers at the 1923 meeting of the American Welding Society in Pittsburgh, Oct. 24-26 are Comfort A. Adams, H. M. Hobart, Samuel W. Miller and T. F. Barton.

A SURE WAY to get fast, low-cost metal joining...

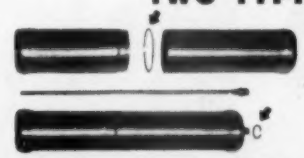
PREPLACE

THE BRAZING ALLOY

ALLOY PREPLACEMENT is a key factor in the tried and proved EASY-FLO and SIL-FOS low-temperature silver alloy brazing formula that gives you *any brazing production you want* at surprisingly low cost. It's a simple abc formula... where a = assembling parts with EASY-FLO or SIL-FOS *pre*placed at the joints... b = using a fast heating method such as oxyacetylene torch, furnace, electrical induction, gas-air burners, etc.... c = devising a production set-up that keeps assemblies moving steadily to and through the heating station. This formula eliminates the human element from the actual brazing. It assures fast, reliable production with unskilled labor.

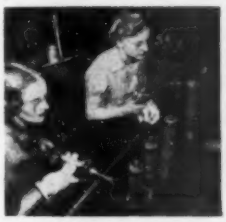
EASY-FLO and SIL-FOS are available in rings, washers, shims and other preformed shapes to suit specific joint requirements.

TWO TYPICAL EXAMPLES



INSECTICIDE BOMB

Steel shell stampings and copper vapor tube joined with rings of EASY-FLO preplaced. Two girls turn out 120 bombs per hour.



NAVY BUZZER CASE COVER

8 posts and gasket brazed to cover with EASY-FLO wire rings preplaced. Assemblies go thru furnace 1500 a day.

A BRAZING PRODUCTION EXPERT IS AT YOUR CALL

Without obligation one of our field engineers will call and tell you if, where and how you can use the preplacement formula to advantage. Write and say when. *FOR FULL FACTS IN PRINT* write for a copy of BULLETIN 20...

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MONTREAL, CANADA

AT THE METAL SHOW—CLEVELAND—OCT. 19-23

SEE an actual application of the preplacement formula in action... Also many more examples of EASY-FLO and SIL-FOS production-brazed assemblies... *TALK* over your metal joining problems with our experienced engineers.

BOOTH 941

FOR BEST RESULTS USE

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Silver Brazing Alloy preforms for Production Brazing. Rings, Stamped or Coined Washers and Wire Forms

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1200 FLUX

for silver brazing Brass, Stainless Steel, Bronze, Nickel-Silver, Steel, Monel, Inconel, Nickel. Furnished in ½ lb., 1 lb., 5 lb., 30 lb., and 65 lb. containers.

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PLANTS: DETROIT, ST. LOUIS, MILWAUKEE, MINNEAPOLIS, INDIANAPOLIS

OFFICES: KANSAS CITY, GRAND RAPIDS

Photo Courtesy Peerless Welding Co., St. Louis, Mo.

✓ THE MECO CIRCLE MIXER—Correctly proportions welding gases for maximum efficiency and superior results without creating the least resistance to their flow.

✓ SPRING TENSION NEEDLE VALVES—Insure permanent adjustment at any point. Adjustments can be accurately made and held in place regardless of bumping or jarring of welding handle.

✓ ARMORED GASKET TYPE JOINT—Provides a leak-proof seal between torch handle and mixing chamber, or torch handle and cutting attachment—minimizes wear.

Meco

FREE—send for New MECO Catalog No. 150 today!

Modern Engineering CO., Inc.

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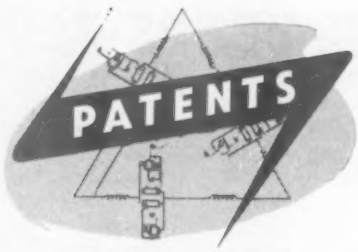
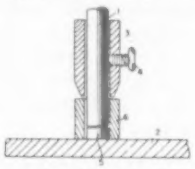


Arc Welding Method

2,643,319. PAUL CHRISTIAAN VAN DER WILLIGEN, Eindhoven, Netherlands. Assigned to Hartford National Bank and Trust Co., Hartford, Conn. Filed Dec. 24, 1948. Granted June 23, 1953.



This patent covers a method for joining two metallic workpieces by arc welding. First, the two workpieces are placed in abutting position. Then a slag-forming body is placed between the workpieces. One part of the body abuts one workpiece close to the arc. The other abuts a part fixed for movement with the workpiece at a region spaced from the welding arc. This keeps the workpieces apart. An electric current is passed through the workpieces to initiate a welding arc. The resulting arc continues between the metallic workpieces until the slag-forming body begins to melt and deform to so permit approach of the one workpiece toward the other. Upon sufficient melting and deformation of the slag-forming body, both workpieces are permitted to contact each other after a predetermined period of time subsequent to initiation of the welding arc.

* * *

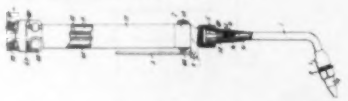
Alloy Binder for Tubular Rods

2,642,516. HOWARD S. AVERY, Mahwah, N. J. Assigned to American Brake Shoe Co., New York City. Filed March 31, 1950. Granted June 16, 1953.

A newly-granted patent refers to a tubular welding rod containing filler materials. The filler materials have mixed with them an inorganic chemical compound selected from the sodium metasilicate hydrates to provide a binder for the filler materials. The filler materials and chemical compound are granular when initially inserted in the welding rod. The chemical compound provides a binder since it melts during processing of the rods and congeals upon cooling to solidify the filler materials.

Welding and Cutting Torch

2,645,277. CHARLES R. RICHTER, Schenectady, N. Y. Filed Nov. 23, 1948. Granted July 14, 1953.



This newly patented welding and cutting torch is adapted for use with city gas drawn directly from the main, under pressures as low as 1 psi or less. The torch has a tip secured to the end of a torch pipe. The tip has a comparatively small centrally-located discharge opening in it and a number of comparatively large openings around the central opening. The large openings communicate with the torch pipe. Passages communicate with the torch pipe to conduct the gas from the source of supply to it. They form with the pipe a substantially straight passage of substantial cross-sectional area throughout the major part of the length thereof. This provides for the free flow therethrough of the gas under the low pressure. Special means form a comparatively short, Venturi-like restriction in the passage. A nozzle is centrally placed in the passage in a zone quite remote from the tip to provide for the free flow of gas around it. It cooperates with the restriction to form an injector. Other means communicate with the nozzle for conducting oxygen to it from a source of supply under comparatively high pressure. The discharge oxygen from the nozzle induces a flow of the gas from the zone around the nozzle through the restriction. The cross-sectional area of the passage increases rapidly from the discharge side of the restriction to reduce back pressure on the gas flowing through the restriction. Means are provided for conducting oxygen directly from the source of supply to the centrally-located discharge opening in the tip. A valve having an actuating lever is adapted to be manipulated by an operator for controlling the flow of oxygen through the last mentioned means. The tip has a threaded part adapted to cooperate with interchangeable nozzles for converting the torch from a welding to a cutting torch and vice versa.

* * *

Radioactive Arc Control

2,646,492. WILLIAM E. BALLARD, Harborn, Birmingham, England. Filed July 8, 1950. Granted July 21, 1953.

This patent refers to a welding machine for depositing weld metal along a seam. The welding apparatus is of the type having a chamber for

AUTOMATION with FEDERAL WELDERS CAN CUT COSTS!

Automation is a word invented by production-minded people to describe the automatic handling of material in process, the combining of two or more operations into a single operation to reduce costs and speed production.

Perhaps one of the greatest advances of automation has been made in the resistance welder field where Federal has taken the lead in designing and building welders that have successfully combined forming, handling and/or assembly with welding.

This advancement has, in many production shops, actually eliminated the "welding bay," and made welding an all-important station in the production line.

If welding is part of your operation you should get the facts of cost-cutting automation in resistance welding, and to make sure of getting the complete story consult Federal — "First in Resistance Welding."

Federal® WELDERS

THE FEDERAL MACHINE & WELDER COMPANY

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preheat and postheat problems

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JUST HAS SOMETHING NO OTHER FLUX HAS

YES experienced welders have found that this new all-purpose brazing flux really travels . . . really cleans metals . . . and DOESN'T BURN OUT!

TRY JOHNSON'S NEW FLUX on the toughest job in your shop . . . you'll be convinced that this flux beats any other flux you've ever used!!!

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Sent upon Request

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The ***Champ of Clamps!***

THE GRAND QUIKCET DUAL GRIP TYPE "AS"

Quick setting double-action clamp grips work more securely. Holds irregular and off-parallel surfaces as well as flat work due to pincer action. Easily tightened in cramped areas.

4 SIZES: 2½" TO 6" OPENING
SPATTER-PROOFED—NACO NO. 6 STEEL
(80,000 LBS. TENSILE)

Famous GRAND "C" Clamps

Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat—Replaceable Swivels

LIGHT SERVICE SERIES	MEDIUM SERVICE SERIES	HEAVY SERVICE SERIES
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 2" TO 12"	7 SIZES 4" TO 18"	8 SIZES ¾" TO 12½"

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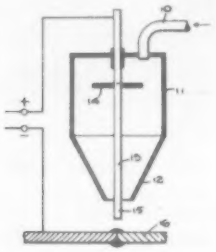
receiving and venting an arc shielding gas. An electrode is supported in

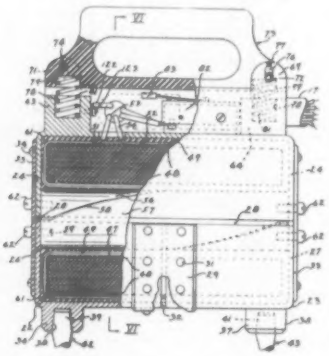


the chamber in the locality of the exhaust orifice. A body of radioactive material is positioned within the chamber in the path of gas passing through the chamber between the inlet and the orifice. It is a distance from the electrode tip corresponding to the ion-pair forming range of the material.

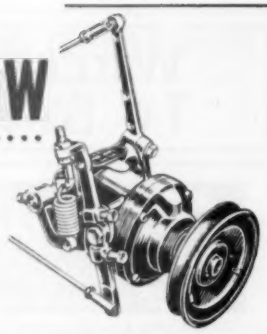
* * *

Portable Spot Welder

2,644,067. COLEMAN H. WATSON, Birmingham, Ala. Assigned 60% to Aaron Sachs, Bessemer, Ala. Filed Dec. 3, 1949. Granted June 30, 1953.



This patent refers to an electric resistance spot welder, comprising a welding gun embodying a shell type housing. The housing is divided into three sections, one of which extends from end to end of the housing, and the other two of which extend partially from end to end thereof. The sections are electrically insulated from each other. A welding transformer in the housing embodies a hollow core and a primary winding on the core. A two-conductor secondary winding for the transformer is located in the core each of which has one end electrically connected to the continuously extending housing section. The opposite end thereof is connected to one of the other housing sections. Electrodes are electrically connected to the other housing sections. Means are provided to supply the primary with alternating current.



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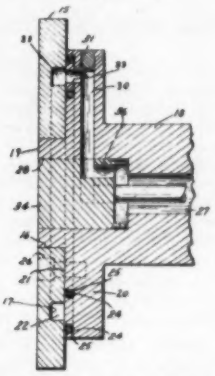
2,643,318. ARTHUR L. WILLIAMS and EMMET A. CRAIG, Warren O. Assigned to Federal Machine and Welder Co., Warren, O. Filed Feb. 7, 1950. Granted June 23, 1953.



A newly patented design for a seam welding wheel includes a ring-like groove formed in the side surface. A flange has a surface abutting the side surfaces and closing the open side of the groove to form a ring-like chamber for receiving coolant. The flange has spaced annular grooves on opposite sides of the chamber. Sealing means within respective ones of the spaced grooves provide against leakage from the chamber.

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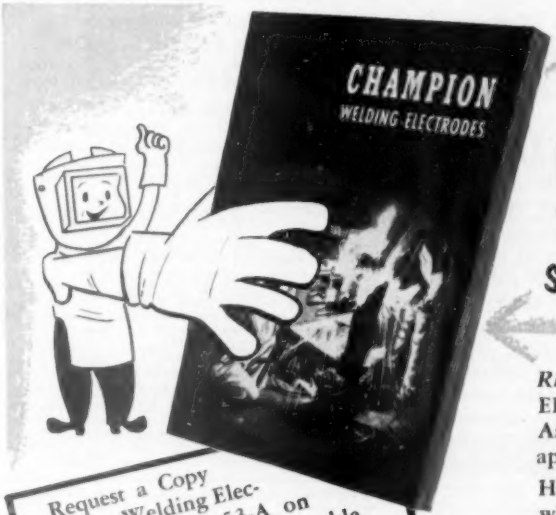

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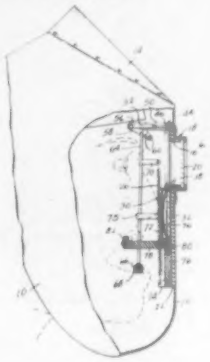
Weld Rod Division
2500 N. COMMONWEALTH AVE.
NORTH CHICAGO, ILL.

Weldor's Helmet

2,644,161. LESLIE A. MEYER, Mill Creek, Ind. Filed Feb. 15, 1952. Granted July 7, 1953.



This patent refers to a weldor's helmet comprising a shield including a front wall adapted to protect the face of a user and formed with a fixed view window. Parallel, vertical guide channels are mounted on the inner surface of the front wall at opposite sides of the view window. A dark window has its opposite side edges slidable in the guide channels for up-and-down sliding movement of the dark window into and out of registry with the view window. A vertically shiftable linkage is connected at one end to the dark window and has its other end proportioned to be received in the mouth of a user. The linkage is arranged for vertical movement, responsive to a closing of the mouth, to a position effective to shift the dark window into registry with the view window. The linkage includes a hanger connected to the dark window. A crankshaft is rotatably mounted on the shield. A crank on the shaft is operatively connected to the hanger for shifting of the hanger responsive to rotation of the shaft. A crank arm is on the shaft. An upstanding push rod is connected at its upper end to the crank arm for translating up-and-down movement of the push rod into rotatable movement of the shaft, and a mouthpiece on the lower end of the rod is adapted to extend into the user's mouth to seat against the lower jaw thereof. A spring is anchored at one end to the shield and has its other end connected to the linkage. The spring is arranged to normally urge the dark window to a position out of registry with the view window.

* * *

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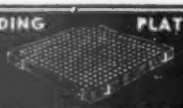

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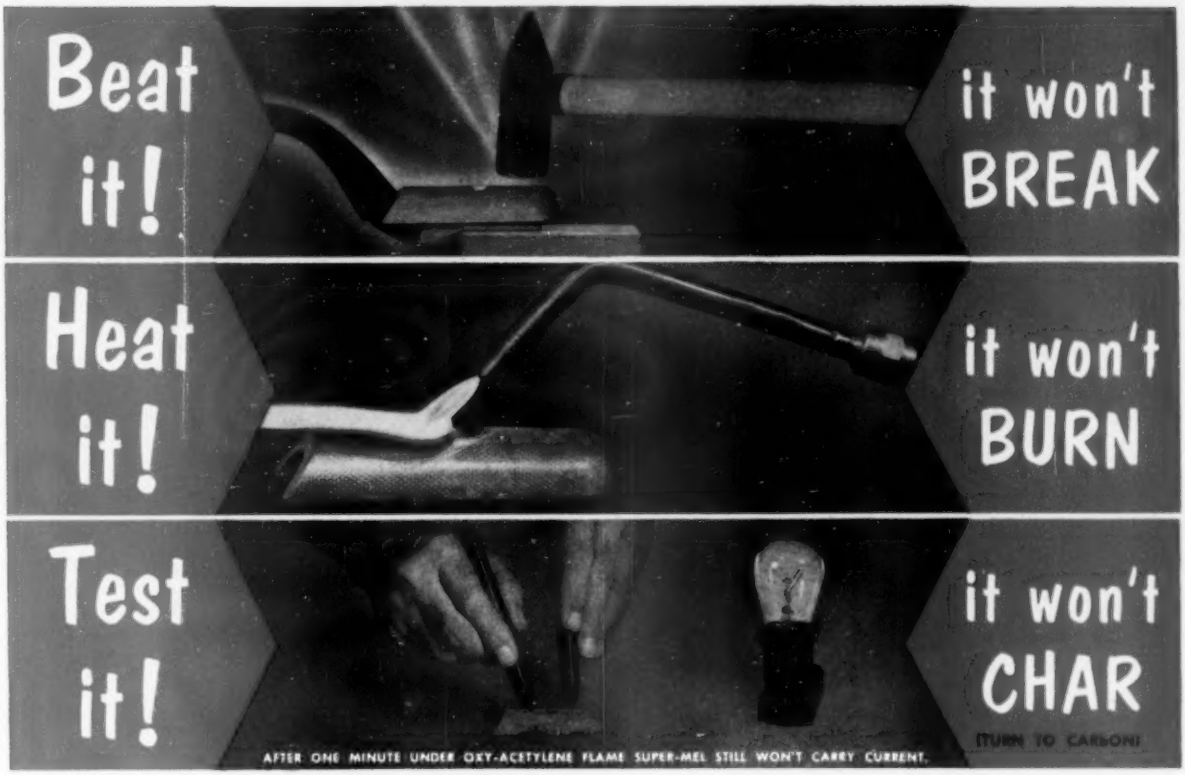

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